AD-A105 085 WEATHER WING (5TH) LANGLEY AFB VA F/G 4/2
TERMINAL FORECAST REFERENCE NOTEBOOK, DETACHMENT 9, 12TH WEATHE--ETC(U)
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PHOTOGRAPH THIS SHEET

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LEVEL

INVENTORY

DTIC ACCESSION NUMBER

ADA105085

Weather Wing (5th) Langley AFB, VA

Rept. No. 5WW/TFRN/81/003

DOCUMENT IDENTIFICATION

1 Feb. 81

Appro[illegible] for [illegible]
Distri[illegible] Un[illegible]

DISTRIBUTION STATEMENT

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DTIC FORM OCT 79 70A

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ADE 850 102

5 WW/TFRN-81/003

TERMINAL FORECAST REFERENCE NOTEBOOK

DET 9, 12th WEATHER SQUADRON

TYNDALL AFB, FLORIDA

Date Prepared: 1 Feb 81

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This technical publication has been reviewed and is approved for publication.

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ADE 850 102

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER 5 WW/TFRN-81/003	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Terminal Forecast Reference Notebook Detachment 9, 12 Weather Squadron (MAC) Tyndall AFB, Florida 1 February 1981		5. TYPE OF REPORT & PERIOD COVERED Final 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Detachment 9, 12 Weather Squadron (MAC) Tyndall AFB, Florida		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Det 9, 12 WS Tyndall AFB FL 32401		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS 12 WS/DO Peterson AFB CO 80914		12. REPORT DATE 1 February 1981 13. NUMBER OF PAGES 123
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) 5 WW/DNS Langley AFB VA 23665		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Tyndall AFB
Weather Impacts
Synoptic Climatology
Climatic Aids
Forecast Studies

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This terminal forecast reference notebook is for Tyndall AFB, Florida. It describes the following topics concerning forecasting weather at Tyndall AFB: location, topography, and local effects; impact of weather on supported units; synoptic climatology; climatic aids; operationally significant forecast problems; approved forecast studies; rules-of-thumb; and special synoptic studies and references.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

SECURITY CLASSIFICATION OF THIS PAGE(*When Data Entered*)

SECURITY CLASSIFICATION OF THIS PAGE(*When Data Entered*)

Record of Changes

Change Number	Date of Change	Pages	Date Posted	Initials

FORECASTER REVIEW

All forecasters will review the TFRN upon initial assignment to Tyndall AFB and seasonally thereafter:

Forecaster	Initial Review	Spring	Summer	Fall	Winter

TABLE OF CONTENTS

Chapter 1

Location, Topography and Local Effects

1-1 Tyndall AFB is located along the Gulf Coast in Northwest Florida at 30°.04'N 85°.35'W. Physically on a peninsula, averaging 3 miles in width and 15 miles in length, Tyndall is almost completely surrounded by water. West Bay and St Andrews Bay encircle Tyndall from NW-N-SE and the waters of the Gulf of Mexico lie from SE-S-NW, there are several minor islands in this southern quadrant however they do not act as climatic barriers.

1-2 Field elevation is 18 feet with no significant height changes within the airfield complex. Within 100 miles of Tyndall the countryside is dominated by gently rolling terrain not exceeding 400 feet.

1-3 The area surrounding Tyndall is predominately woods and marshland with only one major urban center, Panama City located 8 miles to the northwest. The wooded area consists mainly of slash pine, the marshy area is from the east through southeast with another large area of marshes 20 miles to the northwest.

1-4 The only pollution source affecting Tyndall is a paper mill located 5 miles to the northwest. With light winds from 330° under stable conditions, visibilities may be reduced to 2-3 miles in haze and smoke. Due to the unique aroma associated with the mill and its location it is a positive indicator of cold frontal passage.

1-5 Local Effects:

a. Land/Sea Breeze. The sea breeze is a constant occurance during summer but can occur during any month. Two forecast decisions have to be made in association with the sea breeze; 1. Time of on-set and 2. Direction.

(1) Sea breeze will normally occur one hour after max heating during spring and fall (1200-1300L) and by 1000-1100L during summer. With a weak wind gradient, less than 8Kts, on-set will occur when the air temperature exceeds the sea temperature by 5-7°F.

(2) Direction of the sea breeze is from 220°-240°, however this will be modified by gradient winds in the range of 6-10Kts. Actual winds can be determined by computing gradient wind and vectorially adding them to the normal sea breeze of 240° 10Kts. Maximum gust associated with this effect will occur 1-2 hours after onset of sea breeze.

b. Land breeze is not a pronounced effect at Tyndall, as the sea breeze dies off with cooling (normally within one hour either side of sunset) wind flow will return to that indicated by the synoptic pattern (gradient wind).

c. Air Mass Thunderstorms.

(1) During late spring to early fall few fronts penetrate as far south as Tyndall. This results in Air Mass Thunderstorms as the major factor during this period. Associated with the sea breeze, cumulus development begins by mid-morning forming over the land areas. As the sea breeze reaches its maximum penetration, usually 10-20 miles inland, the convective activity will roughly parallel the coastline 10-15 miles inland. This situation presents little threat to Tyndall. During

summer these thunderstorms will normally be steered by the easterlies and generally move from SE to NW. Those thunderstorms moving from the north during this period, generally late afternoon as the sea breeze breaks down, have a tendency to be deflected by St Andrews Bay and miss Tyndall to the east. Slow moving thunderstorms (5-10Kts) regardless of direction of movement have a tendency to follow the coastline either to the south or north of Tyndall resulting in Tyndall being on the edge of the rain shower activity. The main thunderstorm threat to Tyndall during summer are those air mass thunderstorms that develop to the SE of Tyndall while upper level winds have a easterly component. Storms developing in this quadrant have no water barrier to cross in approaching Tyndall and are funneled by the coastline to the north and south so that they follow the peninsula towards Tyndall. This normally occurs when cloud cover inhibits heating and the sea breeze does not reach its full effect allowing convective development closer to the coast.

(2) Nocturnal air mass thunderstorms will normally occur as isolated activity over the Gulf. At sunrise they will often drift along the coastline and may affect Tyndall. Nocturnal thunderstorms will not normally move inland and will dissipate within 1-2 hours after sunrise.

d. Fog.

(1) Due to the abundance of moisture sources fog is perhaps the most significant weather during the winter months. With southerly winds moist warm air is advected into the area where radiational cooling aided by the cold river discharge into the bays and marshes surrounding Tyndall result in ceilings of 100-800 feet and visibilities of one mile or less.

(2) Sea fog caused by warm moist air being advected over the relatively cooler waters closer to shore will normally first show up as a fog bank over the Gulf. When advected into the Tyndall area it produces ceilings/visibilities in the A + B category, this condition can last from several hours to several days. Due to limited data sources in this area the first indication of this occurrence is usually pilot reports from crews in the over water ranges.

1-6 The observation site is located in the Base Weather Station. Hangars located in the E-S quadrant limits the observation of weather in this quadrant. A 25 foot tower is located next to the weather station to aid in observing weather in this quadrant; however, its use is limited during periods of adverse weather.

1-7 Runway Complex: See Figure 1-1. Tyndall's complex contains 2 active runways, they are dual runways oriented 310^{o}-130^{o}. The outside (northern most) runway is 10,000 feet long and transmissometer equipment is located on the north side of both approach end. The inside runway is 8,075 feet long and does not have transmissometer equipment for Runway Visual Range (RVR) readings. Runway 090^{o}-270^{o} is inactive and used for aircraft parking and taxi. Located to the northeast of the central complex is the drone runway oriented 360^{o}-180^{o} length 7,000 feet. This runway is used for launch and recovery of unmanned PQM-102 drone aircraft, there are no meteorological sensors located along the drone runway.

1. GMQ-13A Projector
2. GMQ-13A Detector
3. GMQ-20 Wind Transmitter
4. TMQ-11 Humidity-Temperature Sensor
5. GMQ-10 Projector
6. GMQ-10 Receiver
7. FPS-77 Weather Radar Antenna
8. ML-17 Rain Guage
9. GMQ-10 Receiver
10. GMQ-10 Projector
11. GMQ-20 Wind Transmitter
12. GMQ-13A Projector
13. GMQ-13A Detector

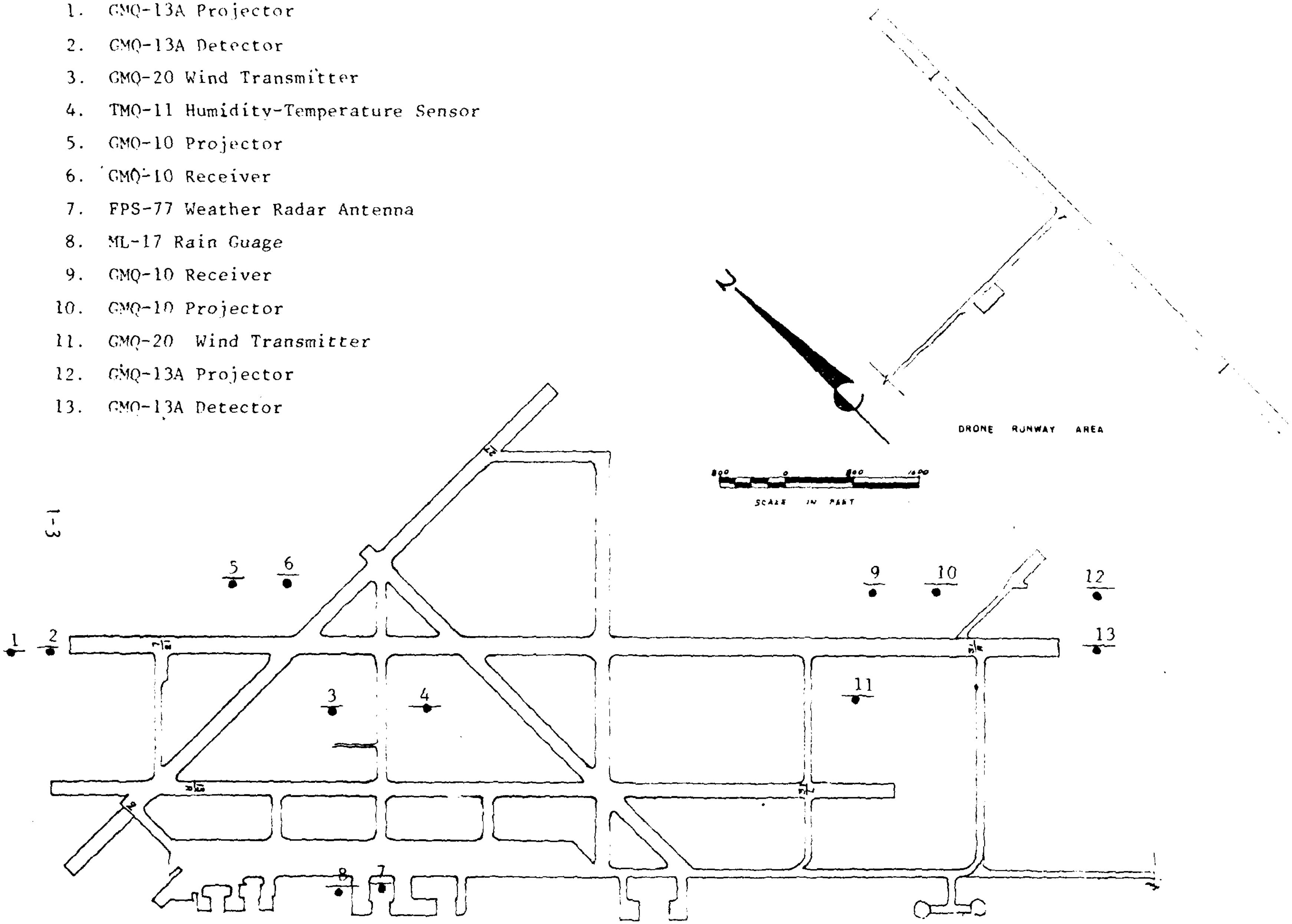
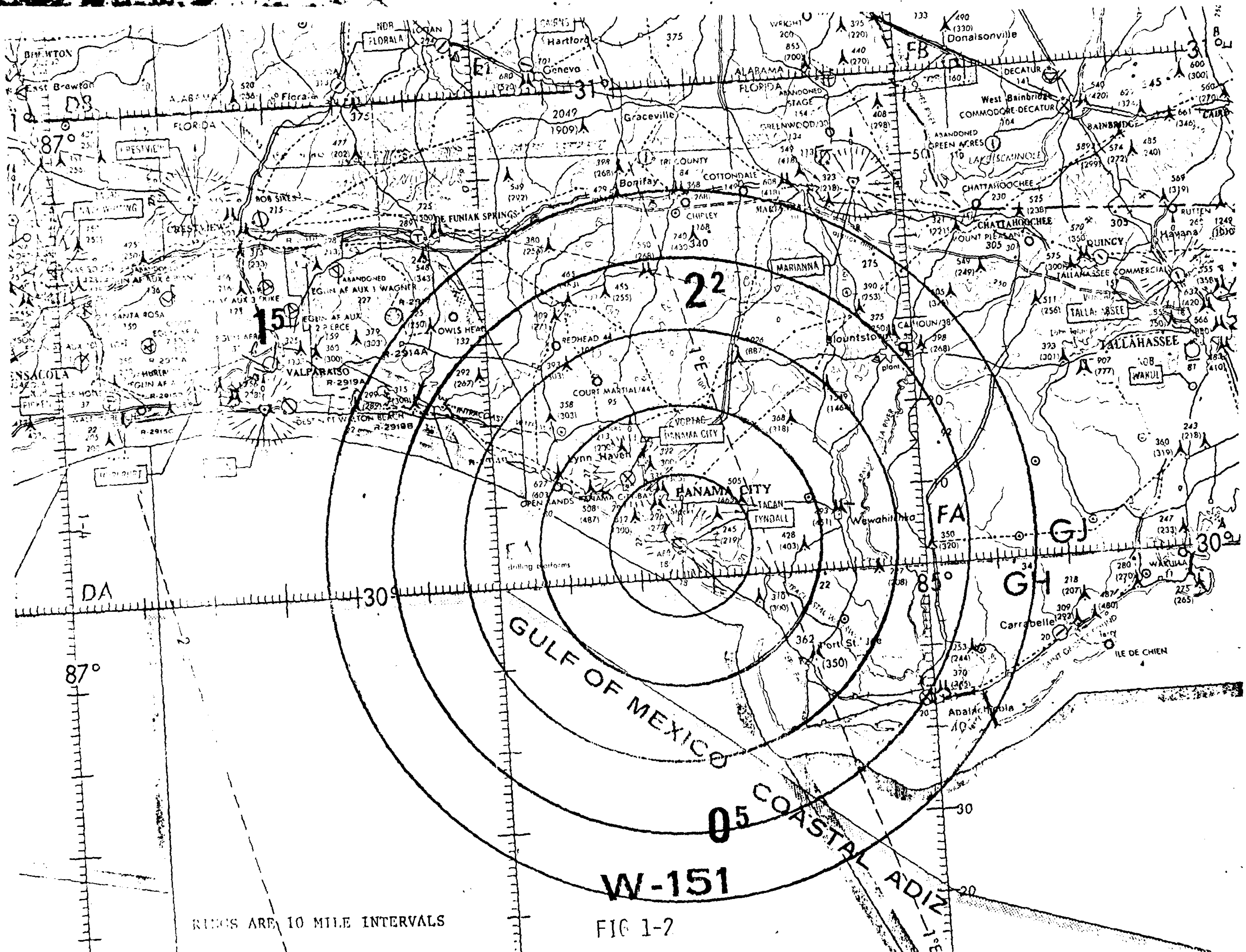


FIG 1-1



RINGS ARE 10 MILE INTERVALS

FIG 1-2

Chapter 2

Impact of Weather on Supported Units

2-1 Unit Supported: Air Defense Weapons Center

a. Operational Squadrons: The primary TAC operational training units are the 2nd Fighter Interceptor Training Squadron, the 95th Fighter Interceptor Training Squadron, the USAF Interceptor Weapons School, the 475th Test Squadron and the 4756th Air Defense Squadron.

b. Types of Aircraft: F-101, F-106, T-33, manned and unmanned PQM-102.

c. Mission: Air Defense, with the capability to provide warning and active protection against the attack. The ADWC provides a single area within the Department of Defense for the centralization of operational and technical expertise on air defense.

d. ADWC Activities: The following is a list of the different activities accomplished by the 5 main operational training squadrons:

(1) 2nd FITS

(a) Training of Air Force and Air National Guard pilots in the skills needed to qualify as mission ready air crews in the F-106 Delta Dart.

(b) Training of Air Force F-101 pilots for utilization within the 2nd FITS and Air National Guard squadrons by providing aircraft and pilots.

(c) Support NORAD war plans by providing aircraft and pilots.

(d) Instrumental training in local flying areas and the W-151 and W-470 over water ranges.

(2) 95th FITS

(a) Provides basic fighter maneuvers and formal pilot upgrade training.

(b) Acts as targets and intercepts for training procedures.

(c) Flys electronic counter measures and chaff target support for student pilots.

(d) Fly observation and damage assessment aircraft in support of PQM-102 drone programs.

(3) USAF IWS

(a) Analyzes, evaluates, develops and recommends standardized tactics, techniques and training methods for all commands that are tasked with an Air Defense/Air Superiority commitment.

(b) Conducts advanced training in all facets of air defense.

(4) 475th TS

(a) Evaluates or improves on current methods, tactics, and equipment being used by strategic air defense forces.

(b) Conducts test and evaluation of weapon systems under consideration for future procurement for the strategic air defense forces.

(5) 4756th ADS

(a) Provides a manual ground control intercept facility.

(b) Maintains and operates an overwater branch to provide water recovery of tow targets and drones.

(c) Has a rescue/alert capability.

e. Environmental Impact:

(1) Take-off/Landing.

(a) Thunderstorms:

1. Weather Element/Threshold: Thunderstorms within the local flying area.

2. Actions/Leadtime: The SOF and DO monitor thunderstorm activity in the local flying area. If short term hazardous weather at Tyndall (winds 35Kts/Hail ½ inch) in known, the flying can be rescheduled with minimum lost training. A thirty minute leadtime is desired. If notification is less than 15 minutes, a diversion of aircraft may be necessary.

3. Cost of Weather Impact: If aircraft are diverted, additional fuel, manhours and time are required to return the aircraft to Tyndall. In many instances, follow-on sorties are cancelled.

(b) Ceiling/Visibility:

1. Weather Element/Threshold: The ceiling/visibility minimums are 300/1.

2. Actions/Leadtime: If weather conditions fall below 300/1, the local flying is restricted or cancelled depending on the weather forecast. Leadtime is variable but normally 2 hours are desired. Diverts may be required if conditions occur after take-off.

3. For a more complete breakdown on various ceiling/visibility requirements, see Attachment 1.

4. Cost of Weather Impact: Sorties weather cancelled, normally require rescheduling. If aircraft are diverted, additional fuel and manhours are required to return the aircraft to Tyndall. Follow-on sorties may also be cancelled. Operational training and three maintenance manhours are lost if the crew preflights.

(c) FCF Weather

1. Weather Element/Threshold: Ceiling/visibility minimums:

TYPE AIRCRAFT	REASON	WEATHER
T-33	Engine Change, Fuel Control Change, Turbine Blade Change	5000 BKN/3
	All Other Reasons	3000 BKN/3
F-101	All Reasons	3000 BKN/3
F-106	Periodic Inspection	8000 BKN/3
	Engine Change, Fuel Control Change	5000 BKN/3
	Ram Air Turbine Change	1500 BKN/3
	All Other Reasons	3000 BKN/3

2. Actions: FCF aircraft are restricted from penetrating an overcast or operating above an undercast unless operational missions are being flown at the same time or an aircraft and aircrew are on five minute alert to help the FCF aircrews land the aircraft in the event of instrumental failure.

3. Cost of Weather Impact: FCFs weather cancelled normally require rescheduling. Training and three maintenance manhours are lost if the crew preflights.

(d) Winds:

1. Weather Element/Thresholds: Cross winds over 15 knots.

2. Actions/Leadtime: If cross winds are in excess of 15 knots, local flying is put on a weather hold until winds subside. If the crosswind is 15 knots with a wet runway, landing aircraft are required to make an approach end barrier engagement.

3. Cost of Weather Impact: When sorties are cancelled, the operational flying training and three maintenance manhours are lost. A barrier engagement closes the runway for approximately 15 minutes.

(2) Range Operating Minimum.

(a) Ceiling/Visibility:

1. Weather Element/Threshold: 3000/5.

2. Actions/Leadtime: If operations receive notice of ranges being at weather minimums at least 2 hours prior to launch, actions can be taken to flight plan a secondary mission to include a possible range change.

3. Cost of Weather Impact: Every sortie that returns with an incomplete range mission is ineffective and must be flown again.

(3) Huricane Evacuation.

(a) Winds:

1. Weather Element/Threshold: Forecast arrival of 50 knot winds associated with a hurricane.

2. Action/Leadtime: Evacuate non-hangared aircraft to a haven base. Decision is based upon the 12 and 24 hour forecast.

3. Cost of Weather Impact: Loss of operational training time.

(4) Precipitation, Hail, Turbulence, Icing and Wind Shear:

WEATHER ELEMENT OR SERVICE	THRESHOLD VALUE	WEATHER IMPACT(S)	TYPE OF AIRCRAFT AND USERS ACTIONS
Precipitation	R-/RW	"Wet Rwy" reduces Crosswind for landing.	All
	Freezing	Dangerous Rwy and Ramp Conditions-Stop Flying	All flights delayed/ cancelled, acft divert
Fcst/Obsvd	Hail	Possible Acft Damage	Acft sheltered/protected
	Turbulence	Possible Acft Damage	All-Pilot makes decision
	Icing	Could affect acft in flight	All-Pilot makes decision
	Wind Shear	Could affect acft landing	All-Pilot makes decision

2-2 Unit Supported: Det 5, 38th Aerospace Rescue and Recovery Squadron

a. Mission: Support launch/recovery of ADCOM target drones.

b. Det 5 activities:

(1) Responsible for drone target recovery operations.

(2) Involved in the rescue of downed pilots.

(3) Searches for mission personnel or equipment.

c. Type of Aircraft: H-3

(1) H-3 weather restrictions

(a) Normal VFR daytime is 700/1 and nightime 1000/2. If the nature of the emergency dictates, 0/0 will be used.

(b) During normal operations, H-3s will stay clear of clouds.

(c) Winds:

1. 30Kts-Requires an instructor pilot to be on board for training flights. H-3s parked on ramp will have their rotors tied down at 30Kts.

2. 40Kts-Training flights will be terminated, helicopters will operate only for life and death rescue operations.

3. 65Kts-Helicopters will be hangared.

2-3 Unit Supported: RCA

a. Mission/Activities: Fly the unmanned PQM-102 drones.

b. Weather Criteria:

TYPE MISSION/ ACTIVITY	CEILING/ VISIBILITY	CROSS/TAIL WINDS
PQM	2500/5	10/15 Landing 10/20 Takeoff
MCS Remote Controlled	1500/3	15/15
MCS Pattern Missions	2500/3	--
Chase	1500/3	10/15
Manual Takeoff	400/3	10/15
Proficiency	400/3	10/15
Cross Country	400/3	10/15
FCF	5000/5	10/15

2-4 Unit Supported: Det 1, 87th Fighter Interceptor Squadron

a. Mission/Activities: Activate air scramble and alert. This is the only alert squadron on base.

b. F-106 aircraft are used.

c. Weather minimums:

(1) Take-off/Landing: 300/1

(2) Maximum Cross Wind: 15Kts

2-5 Unit Supported: 678th Air Defense Group

a. Mission/Activities: The 678th has a three fold mission. The first of these is to provide for the operation of the Tyndall NORAD Control Center. This facility provides active air defense for the southeastern portion of the United States from Brownsville, Texas to West Palm Beach, Florida. The second part of the

mission is the operation of several radar sites along the Gulf Coast and the interior sections of Florida. The third part is to support the Air Defense Weapons Center by providing necessary equipment and facilities to accomplish training objectives.

b. For a complete breakdown of all weather related tasks, see the TNCC SOPs.

2-6 Unit Supported: 111th FIS located at Ellington Air Force Base, Texas

a. Mission/Activities: Air National Guard Training.

b. F-101 and T-33 aircraft are used.

c. This unit is supportive to the TNCC and unique support for them is listed in the TNCC SOPs.

Chapter 3

Synoptic Climatology

3-1 General: Tyndall's climate is mild with a mean maximum temperature of 77°F and a mean minimum temperature of 61°F. Maximum temperatures during summer are moderated by the sea breeze effect and rarely exceed 100°F. Winter temperatures are again moderated by the proximity of the warm waters of the Gulf, the first freezing temperature occurs in late November, early December and the last freeze usually occurs in mid February. Rainfall throughout the year is abundant with the average monthly rainfall exceeding 3 inches, the wettest month is July with a monthly average of 8 inches. The driest month is May.

3-2 Synoptic Weather:

a. Summer: The major controlling feature throughout late May to September is the Bermuda Ridge. The ridge is normally strongly established by early June and dominates the weather pattern through the entire southeast US. Frontal activity in the area is virtually non-existent with few fronts penetrating as far south as Tennessee. (See Figure 3-1). Maritime Tropical Air prevails throughout the summer with the continued flow around the southern portion of the Bermuda high advecting in warm moist air. Winds aloft are relatively weak and from the southeast. During summer air mass thunderstorms are the most frequent weather phenomena. Associated with the sea breeze effect they form 10-15 miles inland and will move with the easterly trades from SE to NW. Steering flow from 10,000 to 20,000 feet should be monitored to project movement. (See Ch 1 - Local Effects). Air mass thunderstorms will normally go through their life cycle to the north of the field without directly affecting the airfield complex. However due to their proximity they have to be monitored closely as they affect both approach patterns and local flying areas. Nocturnal thunderstorm activity will form over the Gulf and often drift along the coastline in light easterly flow aloft. These cells will not affect Tyndall until sunrise when they could penetrate inland if the upper level flow is south-easterly. These thunderstorms are short lived and dissipate 1-2 hours after sunrise. Maximum area coverage of thunderstorm activity during summer takes place ahead of upper level troughs approaching the area. Upper level flow will be from the southwest and associated thunderstorm activity will move northeasterly. (See Figure 3-2). Easterly waves affect Tyndall on the average of once per month during summer with maximum occurrences during July and August. Inverted troughs in the easterlies move slowly to the west (4-6° longitude per day) generally passing to the south of Tyndall over the Gulf. Easterly waves are the producers of prolonged periods of marginal flying conditions at Tyndall causing extensive areas of low clouds, rainshowers and thunderstorms. Detection of easterly wave formation can be difficult due to the sparsity of data on upper air and surface charts, areas of increased RW/TRW over the Gulf and southern Florida/Cuba should be monitored closely. Increased nocturnal activity over land should receive maximum attention. Slowing of easterly waves will indicate deepening while an increase in speed indicates filling.

(1) Fronts: Frontal passage is extremely rare during summer; however, unusually deep penetration of cold fronts (northern Alabama, Georgia) will result in afternoon thunderstorms moving south to stall along the coast. The activity will generally result in intermittent thunderstorms at Tyndall until shortly after sunset.

(2) Visibility Obstructions: During late summer, with stable conditions and still under the influence of high pressure, haze can reduce visibility for several days. Maximum restriction will occur at sunrise and sunset with visibilities of 2-3 miles but will increase to 5 miles by mid morning.

(3) Hazardous Weather:

(a) Air Mass Thunderstorms are generally not of severe intensity. Maximum gust associated with downdrafts rarely exceed 30Kts with the normal occurrence 15-20Kts. Hail is an infrequent occurrence along the coast but is reported several times each summer further inland 15-20 miles. Wind shear associated with thunderstorm activity is not a feature unique to Tyndall; however, as previously discussed, the frequency of thunderstorm activity and its proximity to Tyndall's approaches it must be kept in mind.

(b) Frontal thunderstorm activity is confined to the extreme beginning and end of summer. Cells associated with the rare fast moving cold front at this time of year can produce severe weather. Hail of ¼-½ inch has been reported further inland and gusts in excess of 40Kts can occur at Tyndall.

(4) Gusty Winds: During summer the gradient is weak with gusty winds occurring almost exclusively with thunderstorm activity. These gusts will infrequently exceed 30Kts with the norm being 15-20Kts. On those days that the pressure gradient favors a S-SW surface wind, the combination with the sea breeze can result in winds of 15-18Kts.

(5) Tornadoes: During summer, tornadic activity is an occasional occurrence associated with the few air mass thunderstorms that reach severe intensity, generally occurring with an upper level trough in the area. Tornadic activity is isolated and short lived (15-30 min). A more frequently observed severe weather occurrence at Tyndall is the waterspout. Again a short lived phenomena, rarely exceeding several minutes, they normally occur to the S-W of Tyndall and are most commonly observed with a line of cumulus. Frequently the occurrence of waterspouts has been observed with no tops exceeding 12,000 feet.

(6) Turbulence: Due to the light winds at this time of year turbulence is not a problem other than that associated with thunderstorm activity.

(7) Hurricanes and Tropical Storms: Maximum activity occurs during August and September however they are a threat throughout the summer. Tyndall has 2-3 occurrences per year that require an intensified met watch and once in 3 years is affected by one of these storms. Due to its coastal position and low elevation (18 feet) hurricanes are the most hazardous weather phenomenon to affect the Tyndall area. With only 2 major routes for evacuation storm tide becomes of primary interest.

b. Winter: As the Bermuda Ridge retreats from the area the major controlling feature becomes the Polar Jet. As the jet continues its southerly migration it will allow frontal activity to penetrate to the south of Tyndall. Throughout the winter season, greatly modified continental polar air will alternate with maritime tropical as as the predominant air mass. Several different synoptic situations develop through the winter season and each presents its own forecast problem for the Tyndall area. (Figure 3-3). As the polar jet moves south accompanied by a weak polar outbreak it will present a basicly zonal flow pattern. Fronts approaching Tyndall at this time, most common in the early and late winter, have a tendency to stall just south of Tyndall. With no increase in the amplitude of the associated trough, the quasi-stationary front will slowly weaken but may wave across Tyndall several times bringing associated thunderstorm and rainshower activity for periods of 3-6 hours. Actual movement of this front is hard to forecast; however, it behaves similar to a land/sea breeze induced front in that it generally moves south at night. Wave

development along the front is possible and should be monitored closely. This is the typical "Gulf Wave" pattern and is associated with a broad base trough on the east coast with little amplitude. Split flow is associated with this system with the northern branch of the jet being stronger. The southern branch over the Gulf is relatively weak and may be interrupted. As upper level systems move through Texas, wave formation will occur. (Figure 3-4). Development of a wave along the front will enhance TRW/RW activity and, as it approaches, lower cielings to category C and B. Clearing will occur as the wave moves eastward into the vicinity of TLH. By mid-winter stationary or slow moving cold fronts orientated E-W present our most long lasting low ceilings and visibilities in the form of sea fog. Continued southerly flow will bring in warm moist air from the gulf causing stratus and fog; ceilings will gradually decrease to low B and A categories with visibilities of ¼ to 1 mile. These conditions can last from several hours to several days and will not break until the southerly flow is discontinued or passage of a cold front. With development of the long wave trough over the eastern portion of the US, polar outbreaks will penetrate much further south. Cold fronts will normally move as far south as the Florida Keys before slowing. Frontal activity with these fast moving cold fronts will be more intense but clearing will occur rapidly with frontal passage. Short wave troughs moving through the long wave pattern at this time must be monitored closely as development is often masked. If the axis of the long wave trough is to the west of Tyndall (Figure 3-5) the low will move to the north of Tyndall, warm front overrunning will occur and ceilings will decrease from category D (alto cululus) to category B (nimbo stratus). Visibility will remain low D and C with extensive areas of rain/drizzle and fog. Gradual clearing can be expected with warm frontal passage but as the cold front approaches ceilings of category C are likely until several hours after the cold frontal passage. If the low occludes upstream from Tyndall warm frontal weather can be expected to persist for 6-12 hours after passage of the low. With the axis of a high amplitude trough to the east of Tyndall, (Figure 3-6) cold fronts will move through the Tyndall area rapidly. Thunderstorm activity will be common with clearing occurring 1-2 hours after frontal passage. Associated polar outbreaks at this time will bring our coldest weather with minimum temperatures occurring the second night after frontal passage.

(1) Fronts: Frontal activity reaches its peak during mid-winter averaging one every three days. The predominant problem associated with fronts during winter is the development of waves along quasi-stationary frontal zones over the gulf. Development of these waves can bring considerable amounts of steady rain along with stratus and fog for periods of 1½ to 3 days.

(2) Fog and Stratus: Due to the abundance of moisture sources, fog and stratus are the most common and most difficult forecast parameters at Tyndall. Three situations occur during winter which produce fog and stratus they are:

(a) Sea Fog:

1. This fog is the most common occurrence and can reduce ceilings and visibilities to IFR within a few minutes and keep them down for hours. When a stagnant high to the east puts Tyndall on the back side with the resulting return flow producing a strong southerly flow sea fog is likely. This flow must be maintained for at least 24 hours to advect sufficient moisture into the local area. As this moisture moves north over the relatively colder in shore waters a fog bank will develop off shore. Due to the lack of data to the south, first indications of this occurrence are normally pireps from aircraft using the water ranges. The most common time of occurrence is 1-2 hours prior to sunset. Empirical studies in the past show that 69°F is the critical temperature. When the

temperature falls below 69^{o}F coupled with a dew point spread of 3^{o}F and a fog bank off-shore, forecast fog to reach the base. With no significant changes in the synoptic situation sea fog can reduce ceilings and visibilities to 100 feet and 0 miles and remain through the night. During mid-morning very gradual lifting can be expected but it is common to remain below 500 and 1. A 1-2 hour lifting often occurs by 1400L however with continued southerly flow we can expect to go back down shortly before nightfall.

2. A similar situation occurs with light southerly to southeasterly winds and a radiational inversion. During the early morning hours (check VPS SKEW T) stratus can be expected shortly before sunrise. It is unusual for this stratus to remain more than a few hours and will normally dissipate at the rate of 500 ft of thickness per hour starting 1½ hours after sunrise. If a strong low level inversion is present, stratus may remain throughout the day with a gradual lifting to high B and low C categories.

(b) Gulf Coast Stratus: This term has been applied to just about every fog producing situation in the Gulf Coast area. In its true form it is a condition which affects large areas of the Gulf Coast and is not a situation which results in pockets of localized fog/stratus. It develops when high pressure dominates over the central through eastern Gulf Coast area (Figure 3-7) producing an on shore S-SE flow over the western portions of the Gulf Coast. This results in air with a long trajectory over the warmer gulf waters advecting over the cooler land mass. Upslope conditions through south central Texas will show the first occurrence of low ceilings but the most positive indicator is as these low ceilings expand into the eastern portions of Texas and western Louisiana. Wind flow in the lowest 2,000 feet is from the SE and, with speeds of 20Kts or more at approximately 1,000 feet, will cause penetration of the moisture further inland but result in scattered to broken conditions along the coast itself. The densest fog occurs when these winds are moderate 8-15Kts. As the high pressure drifts eastward and the southerly flow continues, the area affected will increase and move through the central gulf states. Throughout this period fog and stratus will form earlier and last longer each day. Here at Tyndall we can monitor New Orleans (NBG) and expect similar conditions 18-30 hours latter.

(c) Atlantic Stratus: Stratus and fog will move into the Tyndall area as moisture is advected in from the Atlantic. This is the result of a stagnant high pressure area moving slowly through southeast and becoming stationary off the coast of South Carolina/Georgia (Figure 3-8). Return flow will result in low level moisture advection and wind flow from NE to SE, this flow must be maintained for at least 24 hours to allow sufficient moisture to move into our area. The normal occurrence will give some warning through monitoring the progression of low ceilings at upwind stations (JAX, TLH, CTY, GNV). During the first 24 hours ceilings of 200-500 feet will progress as far west as GNV/TLH with only scattered stratus and ground fog reaching Tyndall. Onset of these conditions is normally at night as radiational cooling aids the advection process. With flow remaining the same, ceilings will form earlier on the second night and Tyndall will also go down to category B. These ceilings will persist through late morning. If moisture advection continues past the 48 hour point, low ceilings may last throughout the day with only a gradual improvement to low category C conditions by mid afternoon. Monitoring synoptic conditions and low level wind flow (AQQ and VPS SKEW T) will provide a good basis for forecasting clearing.

(3) Thunderstorms: Thunderstorm activity is virtually nil during the first half of winter and shows a gradual increase during the latter half. By the end of winter thunderstorm occurrences will average 2 per month and their frequency will increase through spring. Thunderstorm occurrence is most common when the low level jet develops over the southern plains and lower Mississippi Valley in advance of a cold front. This brings warm, moist unstable air into the area and triggers frontal and squall line thunderstorms. Severe thunderstorm activity becomes more common through the central gulf states during later winter as the low level jet increases in strength. Development and movement of squall line activity should be watched closely during this period.

(4) Gusty Winds: Average wind speeds are at their highest during winter with mean wind speeds of 7-8Kts. Gusty winds of 12-18Kts are common, occurring on the average of one day out of three. Gusts of 20-25Kts can occur with frontal passage but it is rare for winds to exceed 25Kts during this season.

(5) Tornadoes: Tornadic activity is rarely observed during winter with the isolated occurrences being confined to squall line activity at the very end of the season. Actual instances of tornadoes affecting the Tyndall complex is extremely rare with only one confirmed occurrence in 38 years.

(6) Turbulence: Turbulence, both low and high level, reaches its highest frequency during winter. Below 5,000 feet the frequency of frontal passages and the increased occurrence of gusty surface winds often produce light to moderate turbulence. Upper level soundings (VPS and AQQ) must be monitored closely to detect changes in the polar jet which produce directional and speed shear indicating associated turbulence.

(7) Icing: As to be expected, icing conditions are most favorable during this season. While not a technically difficult forecast problem it does deserve increased interest during this period The most common occurrence is night time; however, with wave formation or frontal overrunning occurring, moisture and stratified conditions will prevail throughout the southeast and aircraft will encounter icing conditions for longer periods of time.

c. Transition Periods: Both periods of transition, Spring and Fall, are the result of the migration of the Polar Jet and the position of the Bermuda Ridge. Neither season has a weather pattern that is truly unique to itself but one that is rather a modification of the true Summer and Winter regimes.

(1) Spring: The Polar Jet begins its northerly migration during March and a gradual decrease in the prevailing westerlies will be noticed. Intrusions of Gulf moisture will increase aided by the strengthening of the low level jet (50-60Kts) over the southern plains and Mississippi Valley area (Figure 3-9). This intrusion of warm moist unstable air in advance of a cold front is favorable for development of squall lines and associated severe weather. Severe thunderstorm and tornado activity in the Mississippi Valley and central Gulf states area is at its highest frequency; however, this activity rarely moves as far east as Tyndall. As in early winter, deep southerly penetration of the Polar air mass is less frequent and associated fronts increasingly become stationary as they enter the Gulf. During the first part of spring the stationary fronts in the Gulf will produce low stratus ceilings (category B and C) and periods of rain as moist Gulf air overruns the frontal boundary. As in winter, wave development can occur along the front but by mid-spring is infrequent and the front will normally be located through central

Alabama/Georgia. Fog and stratus is significant only during the first 2-3 weeks of spring and is normally associated with development of a wave along a stationary front. By mid spring fog becomes an isolated event occurring during the early morning, with southerly surface winds and radiational cooling, and dissipating by 0900L. By the latter third of spring fogs are rare and seldom reduce visibility to 3 miles. By mid-May the effects of the Bermuda Ridge result in fair weather cumulus being the most common weather feature and, with increased heating, will give way to the air mass thunderstorm of summer.

(2) Fall: During the early weeks of autumn little change is noted from summer conditions. The air mass thunderstorms is still the predominant weather feature and the sea-breeze effect is still a daily occurrence. Hurricane/tropical storm development is still favorable and remains a weather consideration until mid-November. By October the penetration of the Polar Jet continues southward, frontal activity will also progress further south into the Tyndall area. Passage of the first cold front through Tyndall and its modified continental polar air bring us our first cool temperatures and indicate our true transitioning from summer to winter. Cold fronts during the first half of fall will bring us ceilings of 2,000 to 3,000 feet and visibility will decrease to 2-3 miles in rainshowers. These conditions are shortlived (4-6 hours) and will improve rapidly with frontal passage. During September and early October fronts will rarely penetrate further south than the Gainsville (GNV) area and weaken rapidly over the Gulf, wave development on these fronts is unlikely. By late October the Continental Polar Air mass is less modified and fronts becoming stationary over the Gulf will persist for several days. Wave development along these fronts will increase through-out the fall forming on one in four by December. Fog and stratus are infrequent during the first half of fall but advection of Atlantic coast stratus can occur by November. Also, wave development during the latter half will produce stratus and fog that can last for 24 hours. Thunderstorm activity decreases rapidly through the season with the air mass and frontal thunderstorm being isolated occurrences during the first part of fall. As the upper level wind flow changes to the stronger westerlies, turbulence becomes a more frequent occurrence, most often in the light category. By late fall the Polar jet can result in moderate-strong occurrences and the upper air should be watched closely for indications of shear. Surface winds remain light but increase during November and December. With more frequent and stronger fronts in the Tyndall area, gusts of 20Kts are common with frontal passage. Icing conditions will increase with more stratiform clouds and are easily detected using the SKEW T. Tyndall will normally experience the first occurrence of freezing temperature during the last week of fall. Due to the surrounding bodies of water, this is later and less frequent than for the surrounding communities.

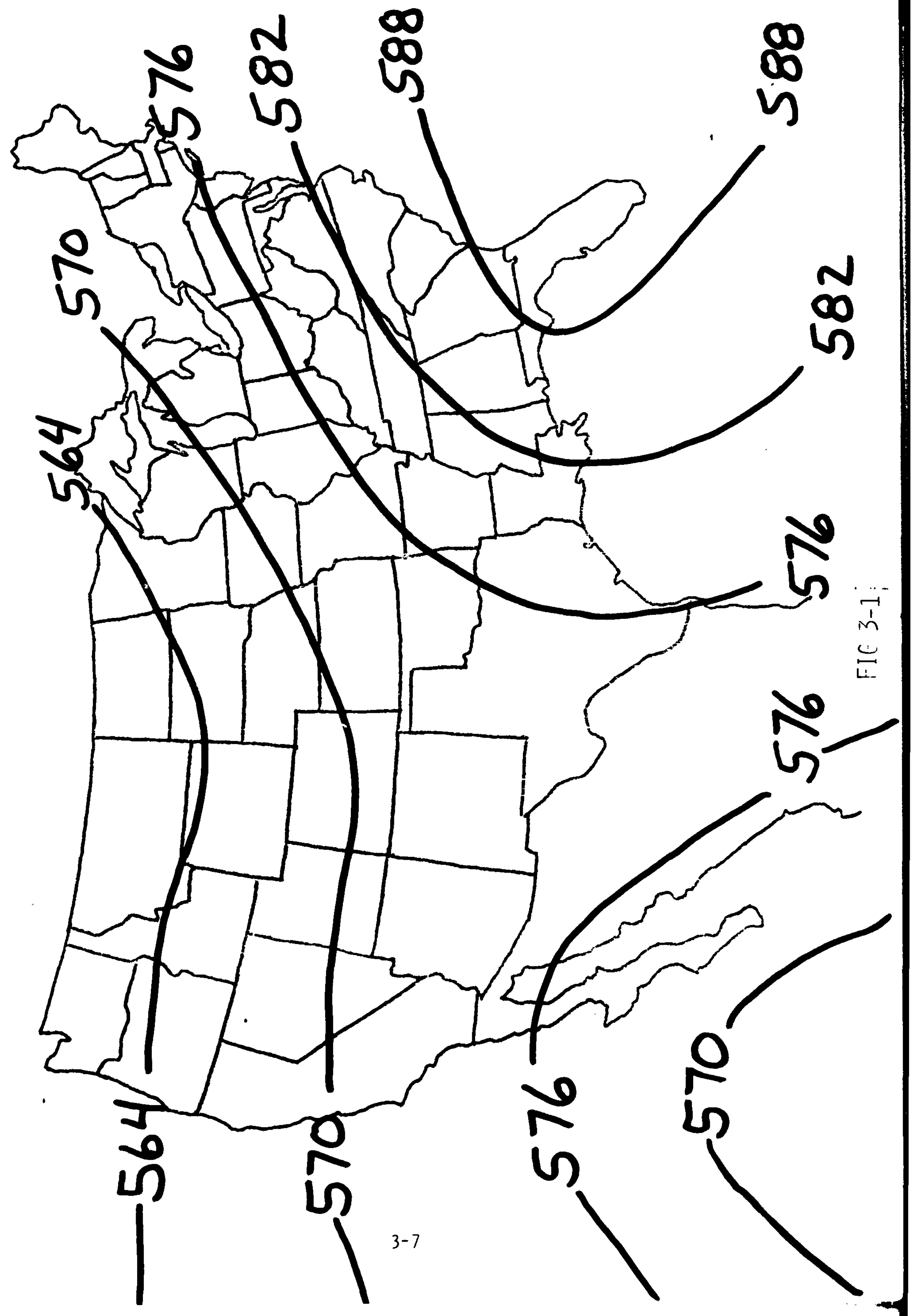


FIG 3-1

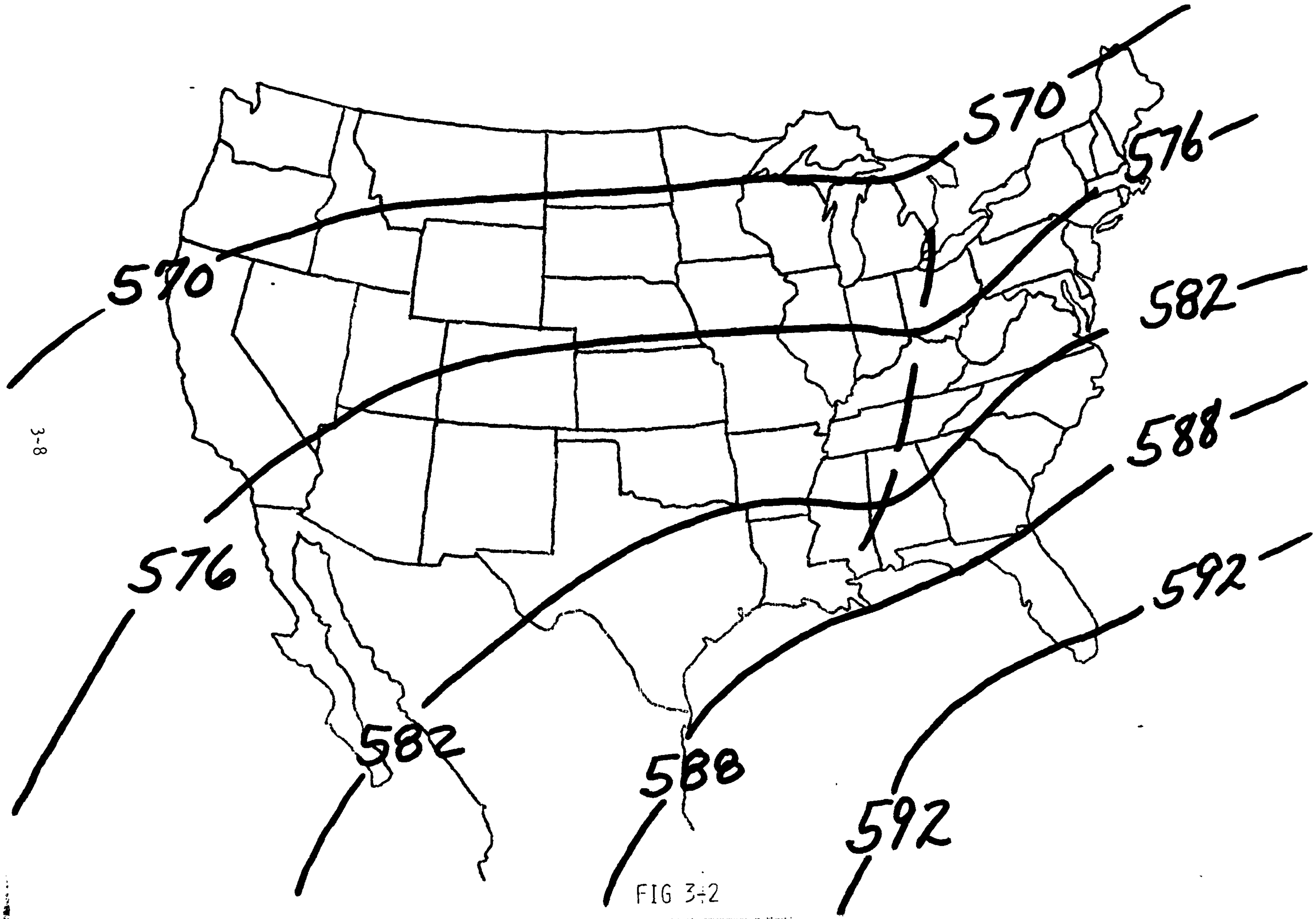


FIG 3-2

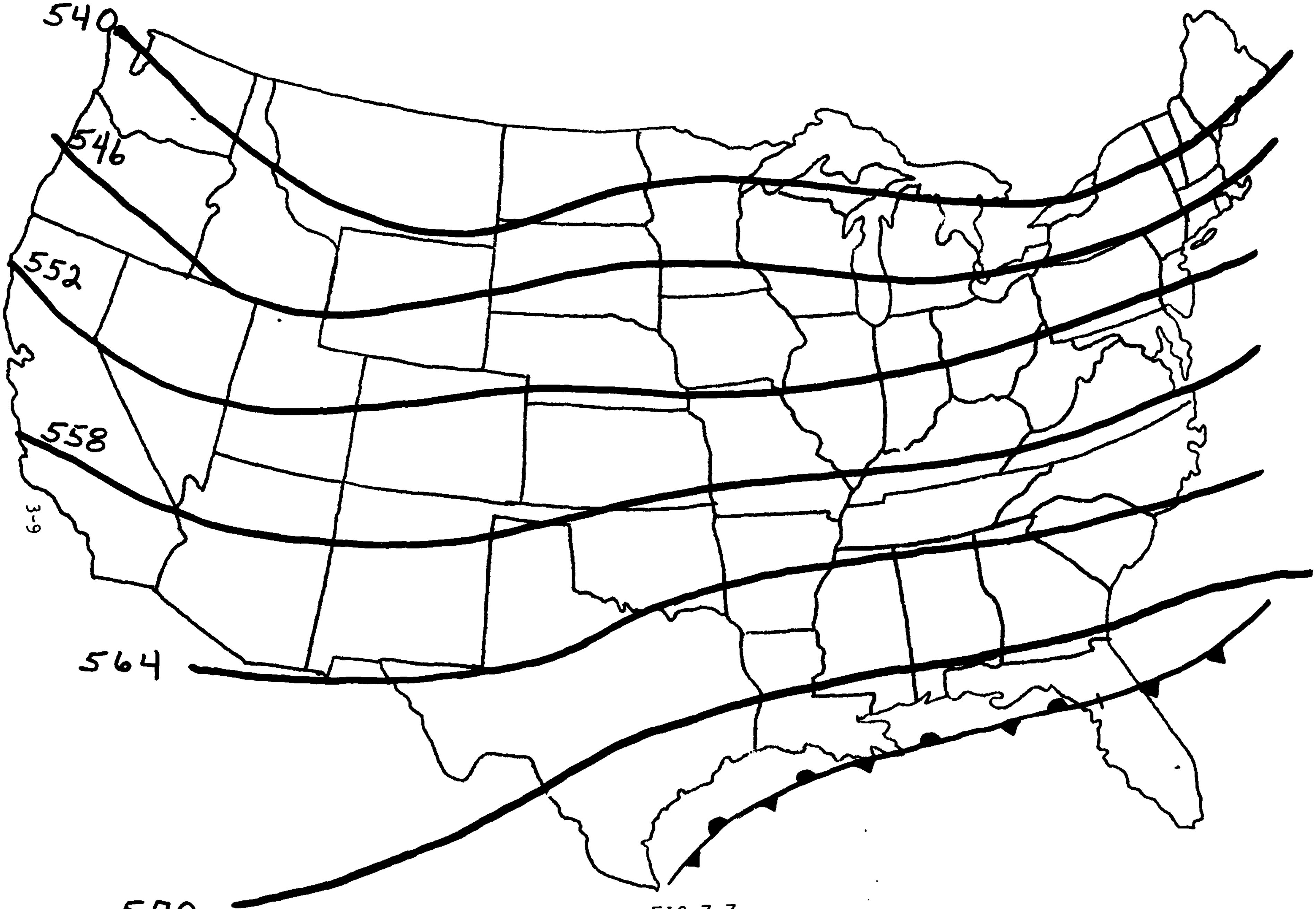


FIG 3-3

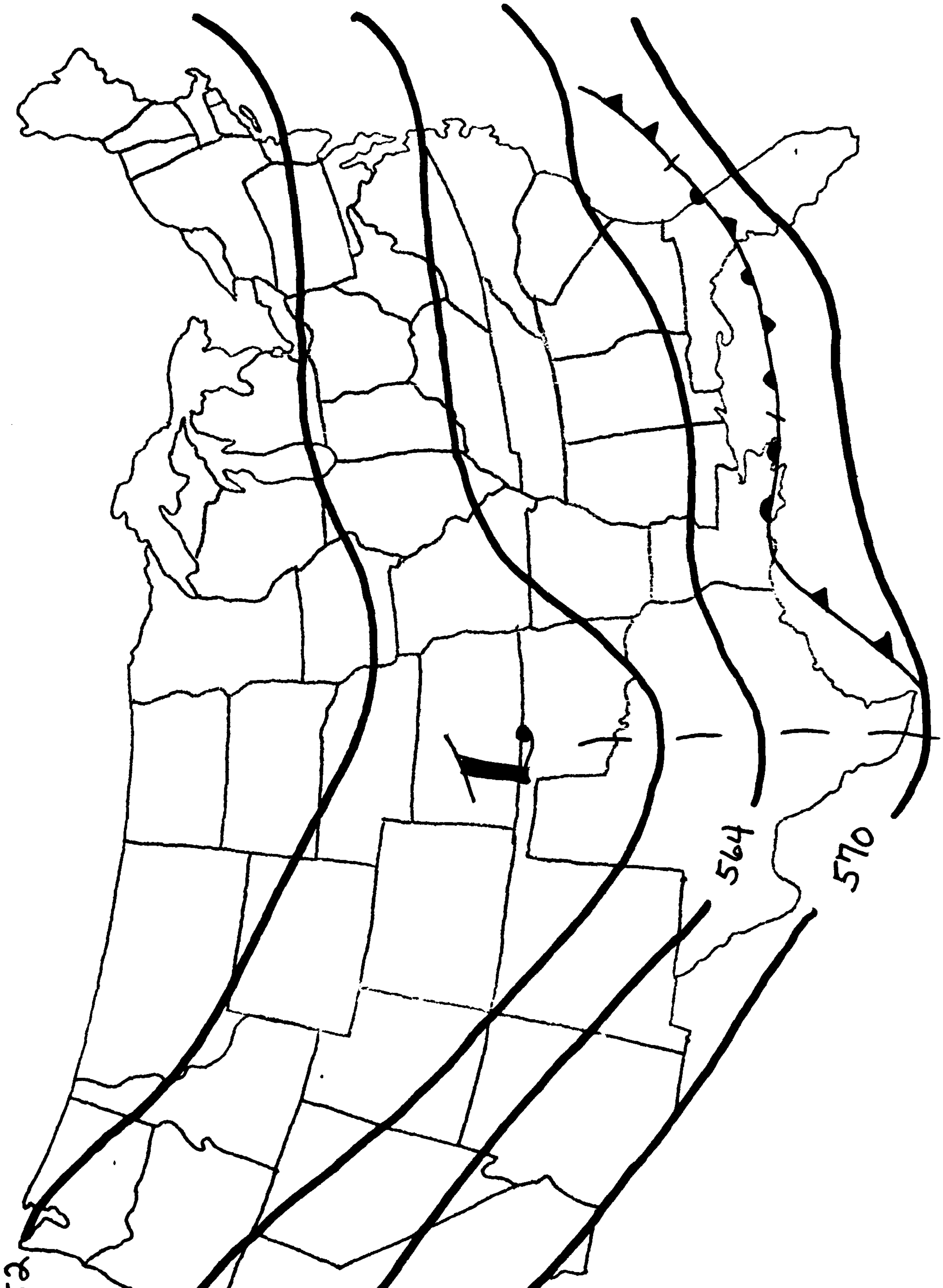


FIG 3-4

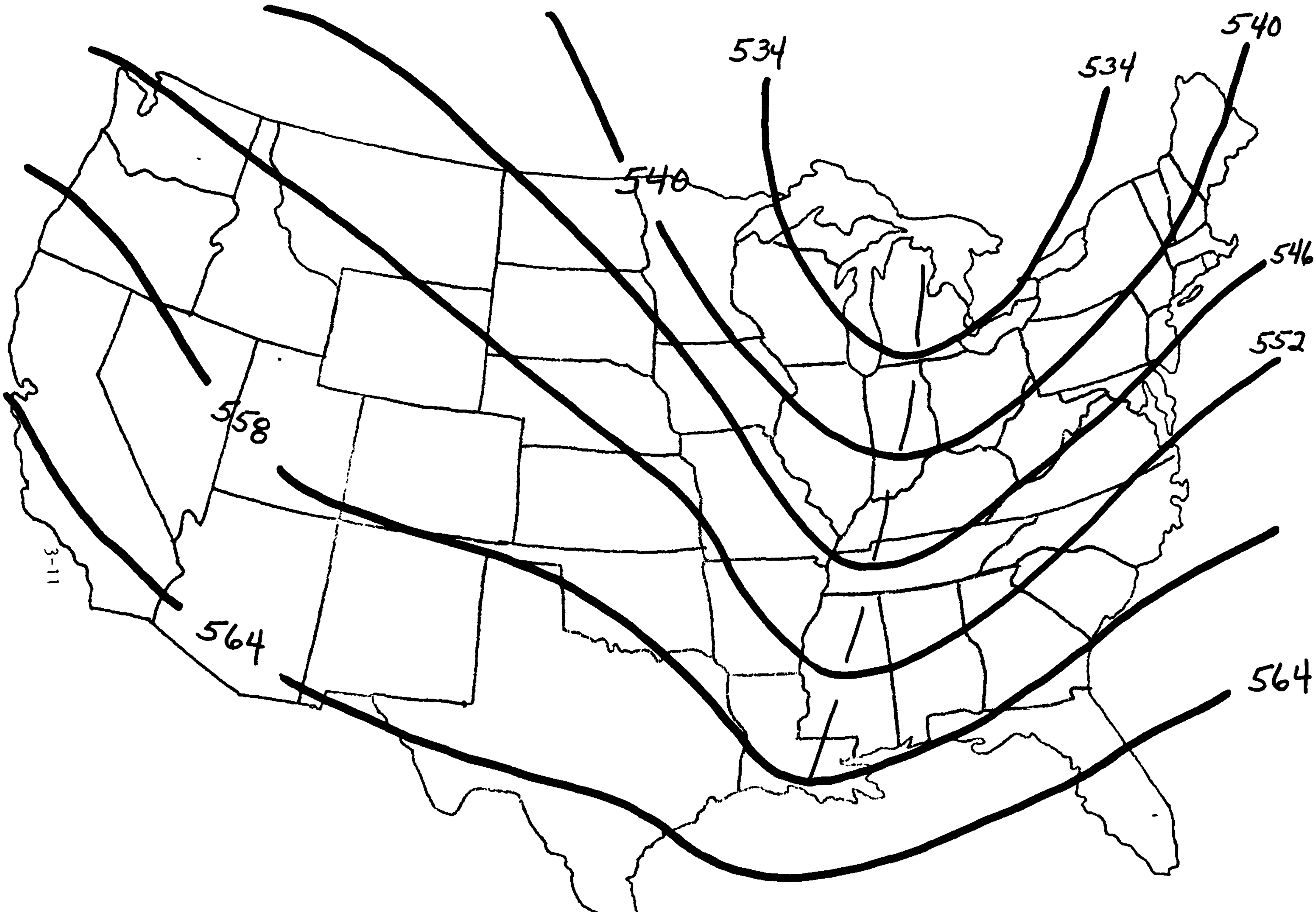


FIG 3-5.

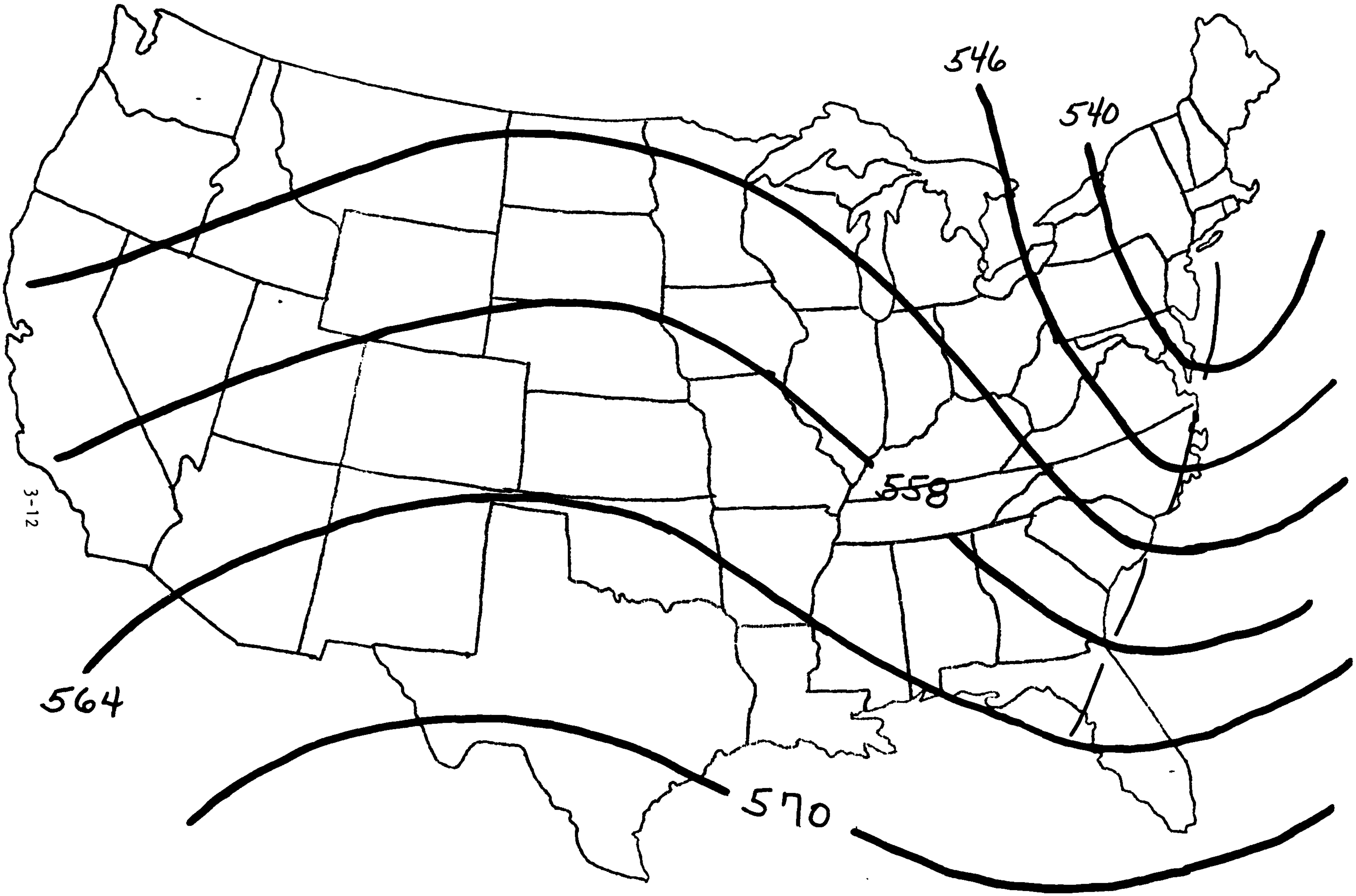


FIG 3-6

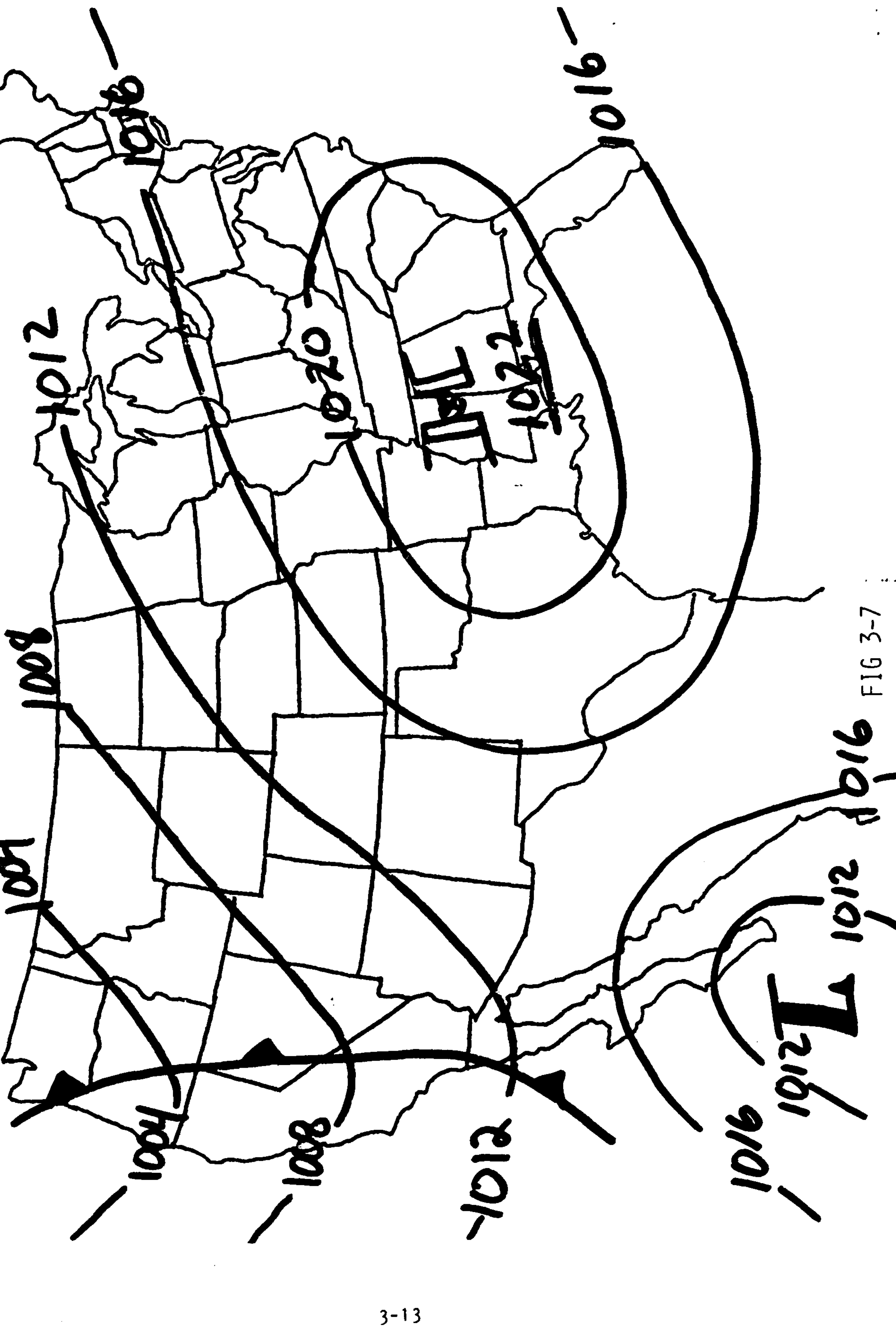


FIG 3-7

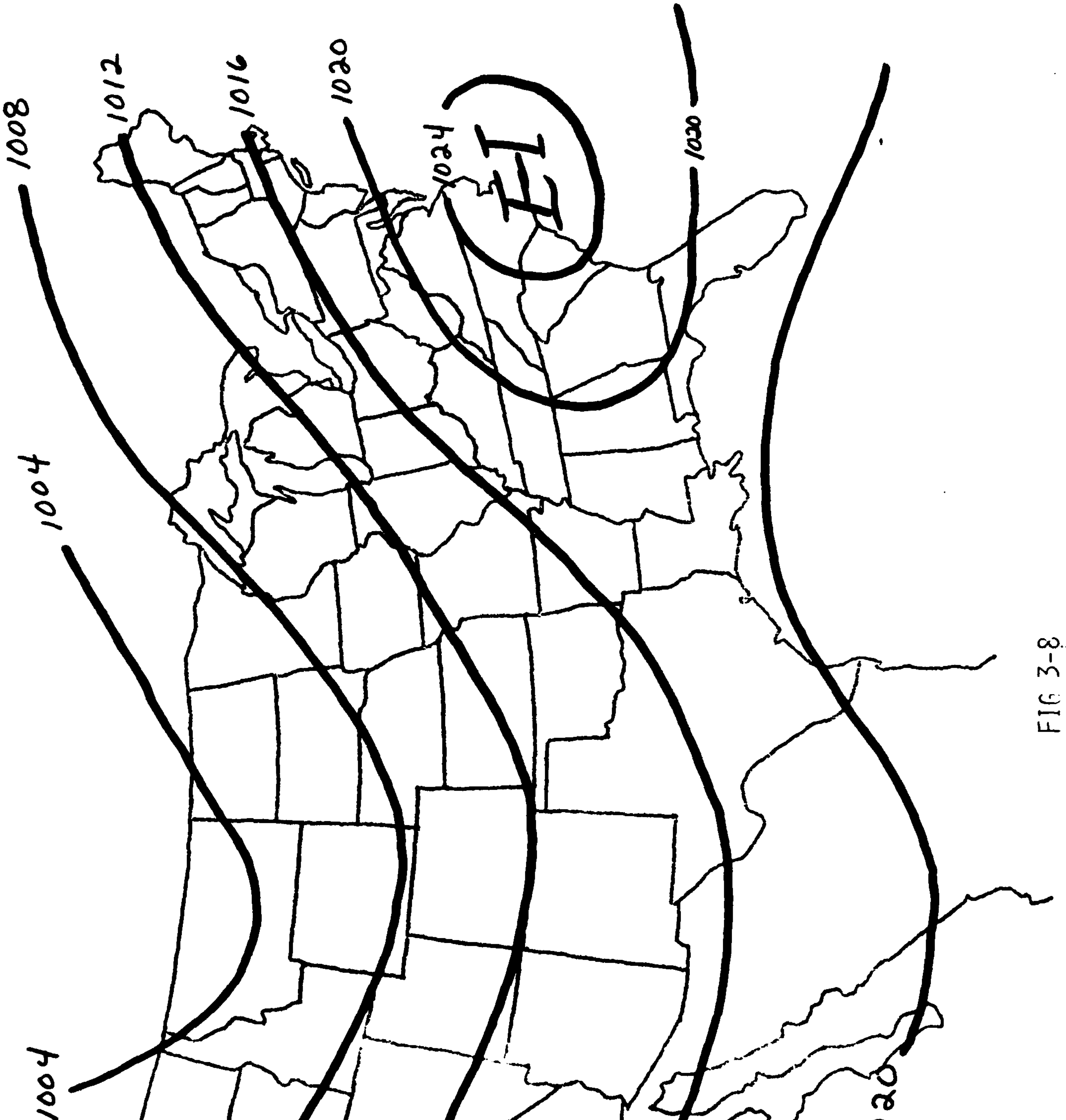


FIG 3-8

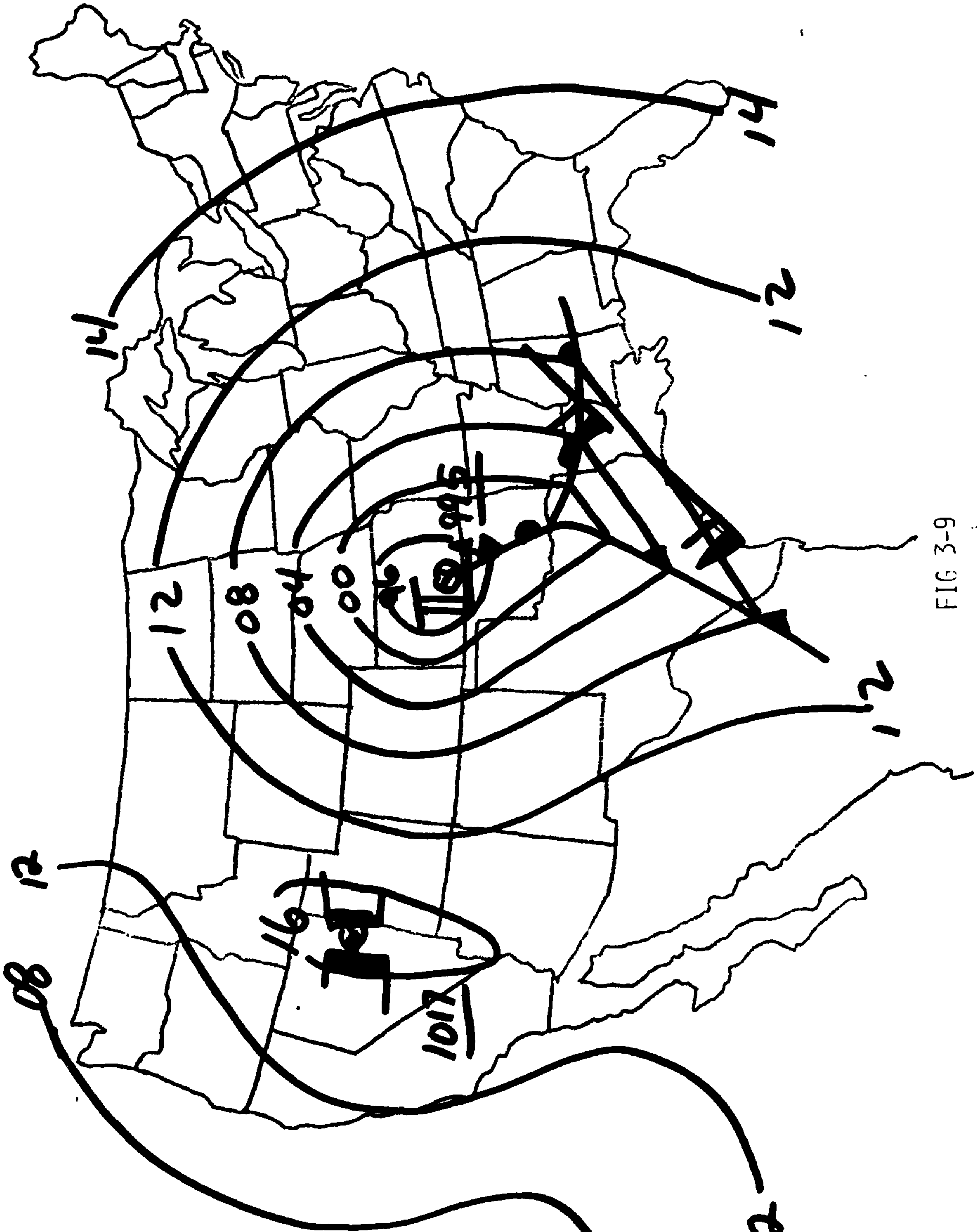


FIG 3-9

CHAPTER 4

CLIMATIC AIDS

4-1. General. The purpose of this chapter is to acquaint forecasters with significant climatic data for Tyndall AFB FL.

4-2. References. Sources for the various tables and figures in this chapter are shown below:

Table or Figure #	Source
Table 4-1	Tyndall AFB RUSSWO
Table 4-2	USAFETAC/DS 79-088
Figures 4-1 - 4-12	Tyndall AFB RUSSWO
Figures 4-13 - 4-24	USAFETAC Project Summarizing Diurnal Pressure Variation
Figures 4-25 - 4-28	Summary of Several Sources including: 3 WW/FM-80/008 NOAA TM NWS SR-58 5 WW Hurricane Briefing
Figures 4-29 - 4-41	USAFETAC TR 78-001

DATA FROM TAFB RUSSWO PERIOD 1942-1980	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
TEMPERATURE (^{o}F)													
Average Max	63	65	69	76	83	87	89	89	87	80	71	64	77
Average Min	46	49	54	61	68	74	76	75	72	63	53	47	61
Mean	55	57	62	69	76	81	83	82	79	71	62	56	69
Absolute Max	82	82	85	92	95	98	101	102	99	93	86	81	102
Absolute Min	13	19	26	42	52	57	67	66	54	40	24	11	11
PRECIPITATION													
Days with	10	11	11	7	7	12	15	15	12	8	7	10	125
Avg Rain (inches)	3.56	3.47	5.26	4.34	2.43	4.94	8 14	7.07	6.13	3.05	3.16	3.64	55.19
Extreme 24Hr Precip	2.69	3.86	6.50	6.31	4.41	4.46	9.05	7.05	8.54	5.12	3.26	3.13	----
Days W/TSTM	1	2	4	4	5	10	14	15	5	2	2	1	65
Avg Rel Hum (%F)	76	75	74	74	75	76	77	77	76	71	72	74	75
Avg Sea Temp (%F)	62	62	64	70	76	80	82	84	82	76	72	66	73
SURFACE WINDS (K) Prevailing	N 8	SSE 11	SSE 12	S 10	WSW 8	WSW 7	WSW 8	WSW 7	E 7	ENE 8	N 8	N 8	--- ---
Peak Winds	S 47	W 52	SSE 46	SW 55	SE 52	N 60	SSE 56	SSE 68	S 69	SSE 43	W 44	W 42	--- 69
FLYING WEATHER													
10,000'/6 mi	58	59	62	71	79	82	83	84	79	82	73	61	73
1,000'/3 mi	85	84	84	90	95	98	99	98	96	96	92	87	92
500'/1 mi	9	9	10	6	2	1	0	1	1	2	4	8	4

TABLE 4-1 DATA FROM TAFB RUSSWO PERIOD 1942 - 1980

PREPARED BY USAFETAC JUNE 1974	STATION NAME TYNDALL AFB FLORIDA(PANAMA CITY) LOCATION N30 04 W085 35	PERIOD APR 42-JUL 72 B ELEV 19	STN LTRS KPAM WBAN NO 13846 WMO NO 76775

AWS CLIMATIC BRIEF

MONTH	TEMPERATURE (°F) MEAN DAILY MAX	MEAN DAILY MIN	MEAN MONTHLY	EXTREME MAX	EXTREME MIN	PRECIPITATION (IN) MONTHLY MEAN	MONTHLY MAX	MONTHLY MIN	MAX 24 HRS	SNOWFALL (IN) MONTHLY MEAN	MONTHLY MAX	MAX 24 HRS	MEAN RELATIVE HUMIDITY (%) LST 03	LST 12	MEAN VAPOR PRESSURE (IN Hg)	MEAN DEW PT (°F)	PRESSURE ALTITUDE (FT) 99.95%	SURFACE WINDS PVLG DRCTN (16 PT)	SPEED MEAN (KT)	SPEED MAX (KT)	MEAN CLOUD COVER (tenths)	PRECIP (IN) ≥ .01	PRECIP ≥ .5	SNOWFALL ≥	SNOWFALL ≥ 1.5	THUNDERSTORMS	FOG VSBY < 7/8 MI	TEMPERATURE MAX ≥ 90	MAX ≥ 80	MIN ≤ 32	MIN ≤ 00
JAN	63	46	54	80	13	3.5	6.7	#	2.7	#	#	#	84	63	.31	46	300	N	9	47	6	8	3	0	0	1	15	0	#	2	
FEB	65	48	56	82	19	3.6	7.8	.9	3.9	#	#	#	83	61	.32	47	400	N	8	52	6	8	2	#	0	2	13	0	#	2	
MAR	69	53	61	85	26	5.2	18.1	.7	6.5	#	#	#	83	61	.39	52	400	SSE	8	51	6	8	3	0	0	4	14	0	1	#	
APR	76	61	69	92	40	3.9	9.2	.0	6.3	0	0	0	85	62	.50	59	350	S	8	55	5	5	2	0	0	3	13	#	8	0	
MAY	82	68	75	98	51	2.6	7.6	#	3.1	0	0	0	86	63	.64	66	250	WSW	[illegible]	42	5	5	2	0	0	5	9	1	25	0	
JUN	87	74	81	98	57	4.6	13.9	.2	4.8	0	0	0	86	65	.76	71	250	WSW	6	60	5	8	3	0	0	9	4	7	29	0	
JUL	88	76	82	101	64	8.0	16.8	1.4	7.3	0	0	0	86	68	.82	73	150	WSW	6	56	6	13	5	0	0	15	2	11	31	0	
AUG	89	75	82	99	66	7.0	16.3	.7	7.1	0	0	0	88	66	.82	73	200	WSW	5	68	6	13	4	0	0	15	3	13	31	0	
SEP	86	72	79	99	47	5.9	20.6	1.9	8.5	0	0	0	87	63	.74	70	250	E	6	69	5	9	3	0	0	6	4	7	27	0	
OCT	80	62	71	93	40	3.2	14.6	#	5.1	0	0	0	83	55	.32	60	300	NE	6	40	4	5	2	0	0	2	3	#	19	0	
NOV	71	52	62	86	24	3.0	10.6	.5	3.3	#	#	#	81	56	.36	50	300	N	7	60	4	7	2	0	0	2	11	0	2	#	
DEC	66	47	56	81	11	3.8	11.7	.5	3.1	#	#	#	82	61	.31	46	300	N	7	46	5	8	3	0	0	2	13	0	#	2	
ANN	77	61	69	101	11	56.3	20.6	.0	8.5	#	#	#	85	62	.52	60	350	N	[illegible]	69	5	97	36	#	0	66	[illegible]	39	173	8	
EYR	30	30	30	30	30	30	30	30	30	27	27	27	30	30	30	30	26	30	30	25	25	30	30	27	29	[illegible]	27	30	30	30	30

REMARKS

RUSSWO POR:
HRLY OBS: APR 42-OCT 46, DEC 46-JUL 72
DAILY OBS: APR 42-JUL 72

(A) HURRICANES/TROPICAL STORMS
(B) HURRICANES ONLY
(POR: 1900-1970)
NUMBER OBSERVED WITHIN

	JAN A/B	FEB A/B	MAR A/B	APR A/B	MAY A/B	JUN A/B	JUL A/B	AUG A/B	SEP A/B	OCT A/B	NOV A/B	DEC A/B	ANN A/B
60 NM						3/1	4/1	4/2	[illegible]	[illegible]	[illegible]		[illegible]
120 NM						11/2	5/1	[illegible]	23/23	[illegible]	[illegible]		[illegible]
240 NM						14/3	13/4	[illegible]	45/23	[illegible]	[illegible]		[illegible]

NOTE * DATA NOT AVAILABLE # LESS THAN 0.5 DAY, 0.5 OR 0.05 INCH, OR 0.5 PERCENT AS APPLICABLE ** [illegible]

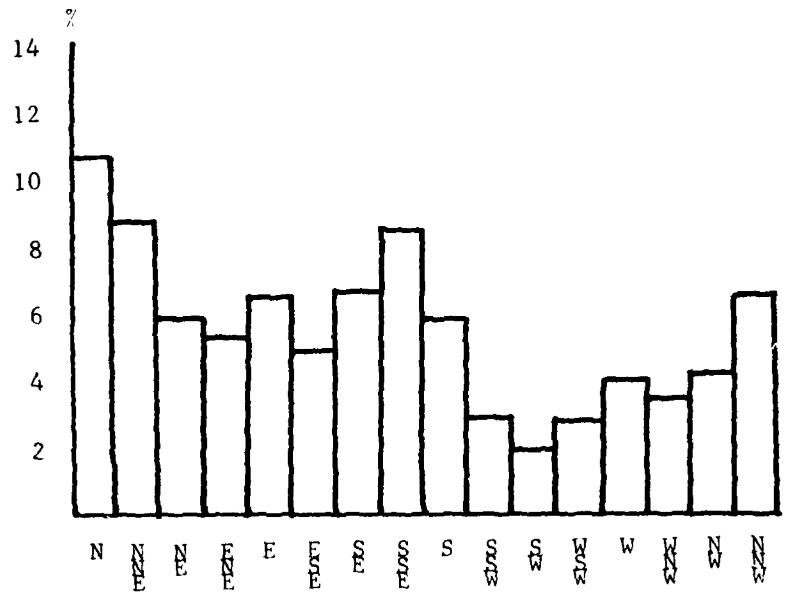
CAV FREQ (%)	HRS LST	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN	EYR
CEILING LESS THAN 3000 FT AND/OR VISIBILITY LESS THAN 3 MI	00-02	30	27	26	21	12	6	5	6	8	8	14	25	16	
	03-05	31	30	31	28	19	10	10	8	10	11	18	28	20	
	06-08	33	32	32	25	18	13	13	12	15	14	20	29	21	
	09-11	25	22	22	15	11	10	13	12	14	11	14	23	16	
	12-14	19	18	18	11	8	9	10	10	14	9	9	18	13	
	15-17	19	16	17	10	7	7	8	6	11	7	8	16	11	
	18-20	21	19	19	12	8	6	6	5	8	7	9	17	11	
	21-23	25	20	22	16	8	5	6	6	7	7	12	22	13	
	ALL HRS	25	23	23	17	11	8	9	8	11	9	13	22	15	30
CEILING LESS THAN 1500 FT AND/OR VISIBILITY LESS THAN 3 MI	00-02	23	22	22	18	9	3	1	2	5	5	12	20	12	
	03-05	24	25	25	25	15	6	3	6	7	8	14	22	15	
	06-08	25	27	26	19	12	7	6	6	10	11	16	23	16	
	09-11	18	17	16	9	5	4	3	4	6	6	10	15	9	
	12-14	12	10	11	6	4	2	2	2	5	3	5	10	6	
	15-17	11	10	11	6	4	2	2	1	4	3	4	10	6	
	18-20	14	13	15	9	4	3	1	1	3	3	6	11	7	
	21-23	19	17	18	11	5	2	1	1	4	4	9	17	9	
	ALL HRS	18	18	18	13	7	4	2	3	6	5	10	16	10	30
CEILING LESS THAN 1000 FT AND/OR VISIBILITY LESS THAN 2 MI	00-02	19	18	19	16	6	1	1	1	3	4	10	17	10	
	03-05	20	21	22	21	11	3	2	2	5	6	11	19	12	
	06-08	20	22	21	15	8	4	3	4	7	8	12	18	12	
	09-11	13	13	13	6	2	2	1	1	3	4	7	10	6	
	12-14	8	7	9	4	2	1	1	1	2	2	3	7	4	
	15-17	8	8	9	4	2	1	1	1	2	2	3	7	4	
	18-20	11	11	12	7	2	1	1	1	2	2	5	8	5	
	21-23	16	14	15	9	3	1	#	1	2	2	7	13	7	
	ALL HRS	14	14	15	10	5	2	1	2	3	4	7	12	7	30
CEILING LESS THAN 200 FT AND/OR VISIBILITY LESS THAN 1/2 MI	00-02	9	8	10	5	2	#	#	#	#	1	5	7	4	
	03-05	10	10	11	8	3	1	#	#	1	1	5	8	5	
	06-08	8	8	8	4	2	1	#	#	#	1	4	7	4	
	09-11	2	1	1	#	0	0	#	#	0	#	#	1	#	
	12-14	1	1	1	#	0	#	#	#	#	#	#	1	#	
	15-17	1	1	2	#	#	#	#	#	0	0	#	1	#	
	18-20	4	3	4	1	#	#	#	0	#	#	1	2	1	
	21-23	7	7	7	2	#	0	#	#	#	1	3	5	2	
	ALL HRS	5	5	6	3	1	#	#	#	#	1	2	4	2	30

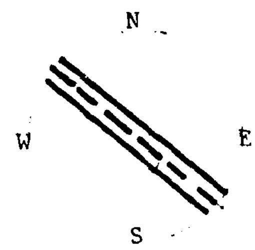
AWS FORM APR 74 62
PREVIOUS EDITION IS OBSOLETE.

TABLE 4-2 CLIMATIC SUMMARY FOR TYNDALL AFB

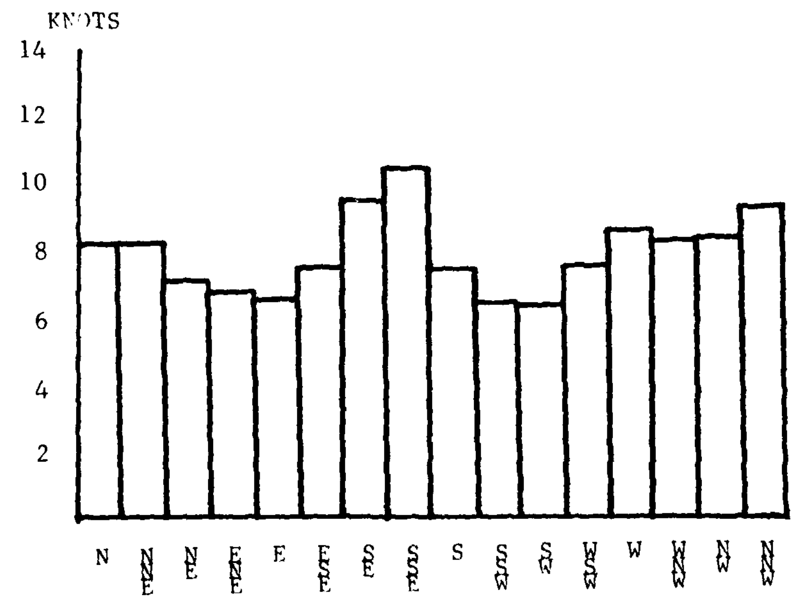
JANUARY

DIRECTION
PERCENTAGE FREQ.





WIND SPEEDS
MEAN



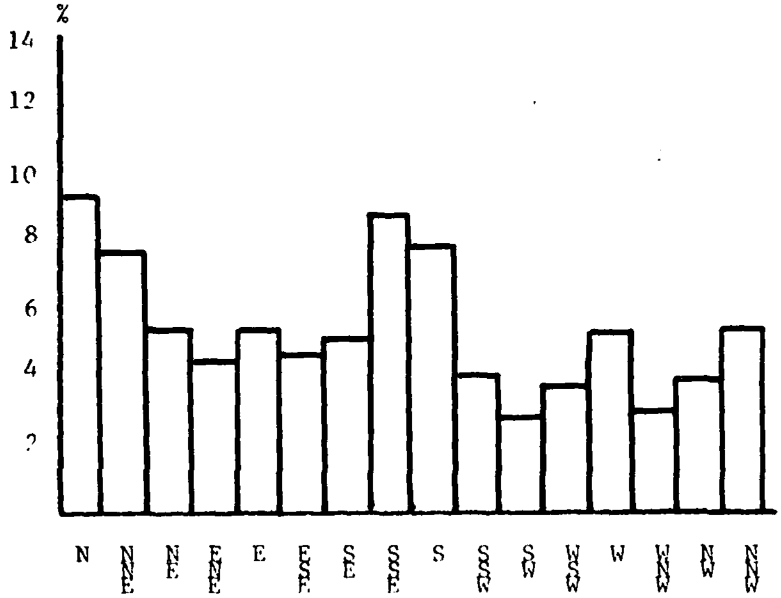
MEAN WIND SPEED 7.1

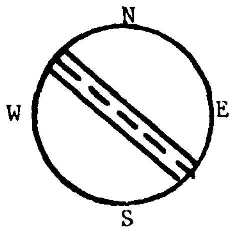
EXTREME WIND SPEED 47

FIG 4-1

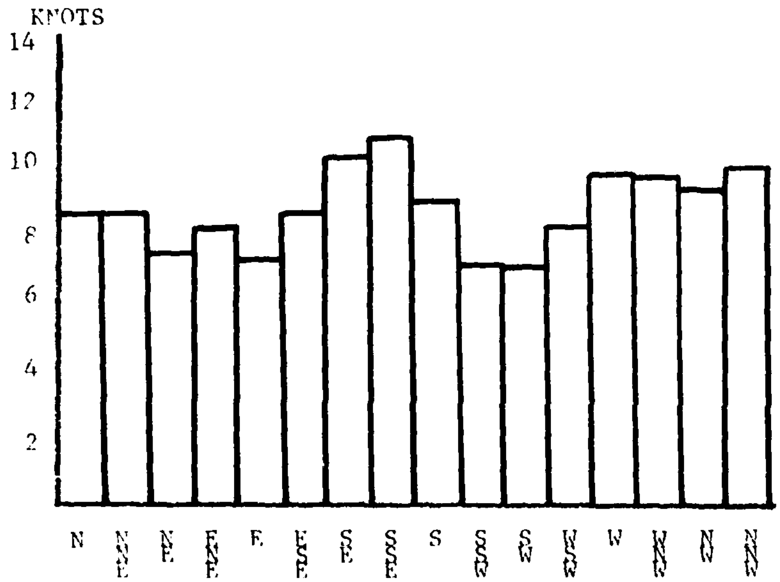
FEBRUARY

DIRECTION
PERCENTAGE FREQ.





WIND SPEEDS
MEAN



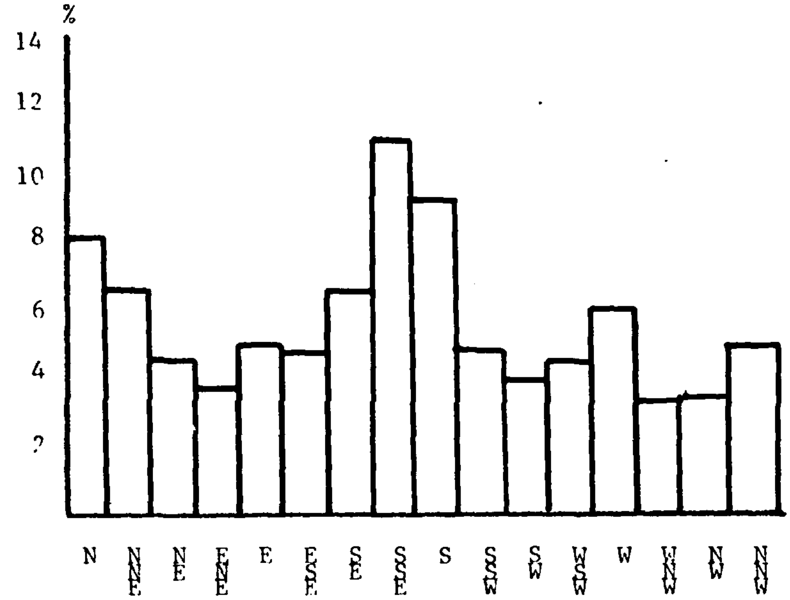
MEAN WIND SPEED 7.9

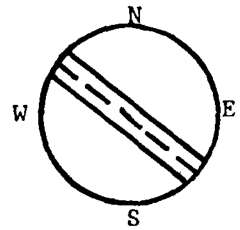
EXTREME WIND SPEED 52

FIG 4-2

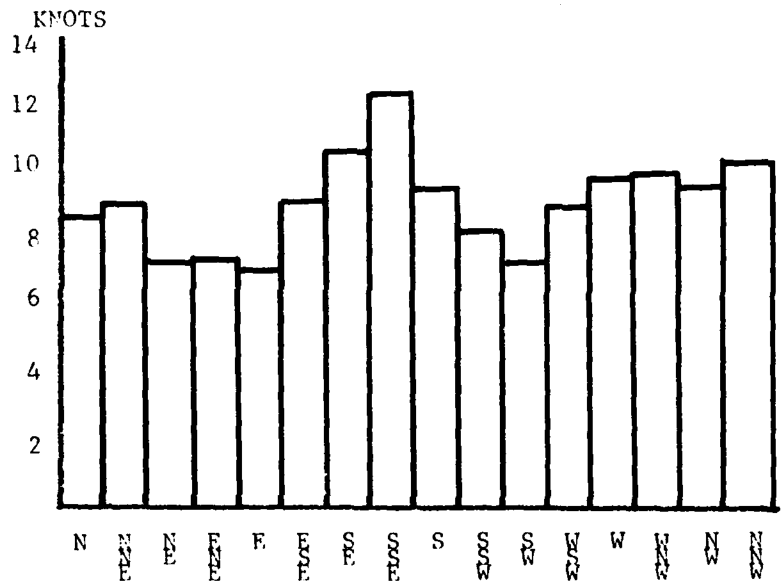
MARCH

DIRECTION
PERCENTAGE FREQ.





WIND SPEEDS
MEAN



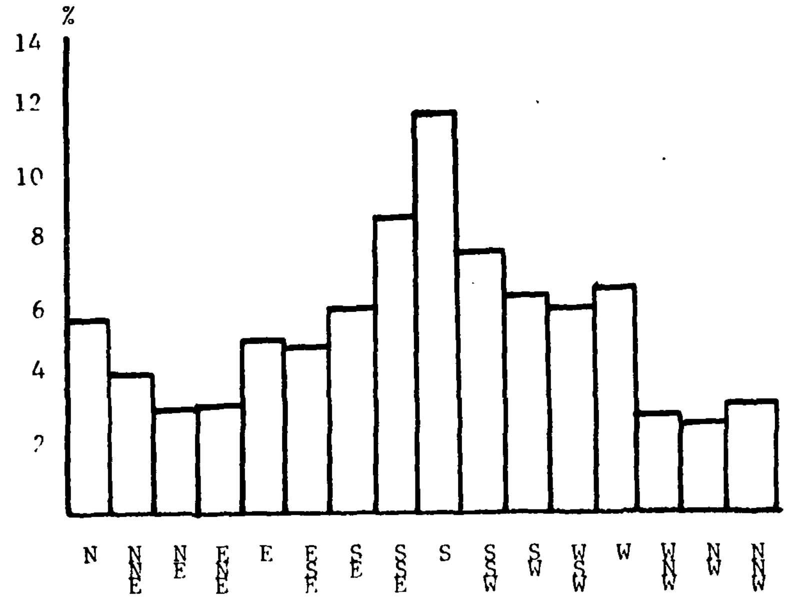
MEAN WIND SPEED ____

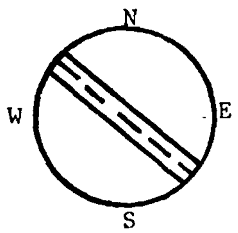
EXTREME WIND SPEED 51

FIG 4-3

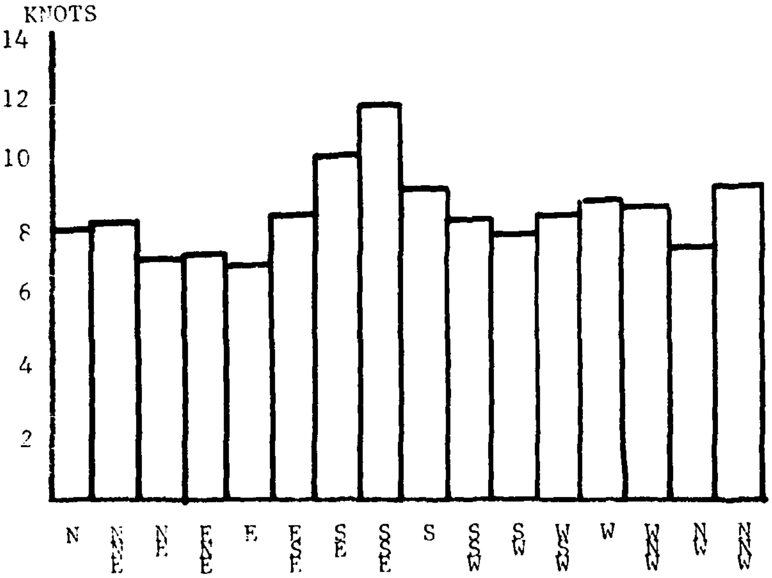
APRIL

DIRECTION
PERCENTAGE FREQ.





WIND SPEEDS
MEAN



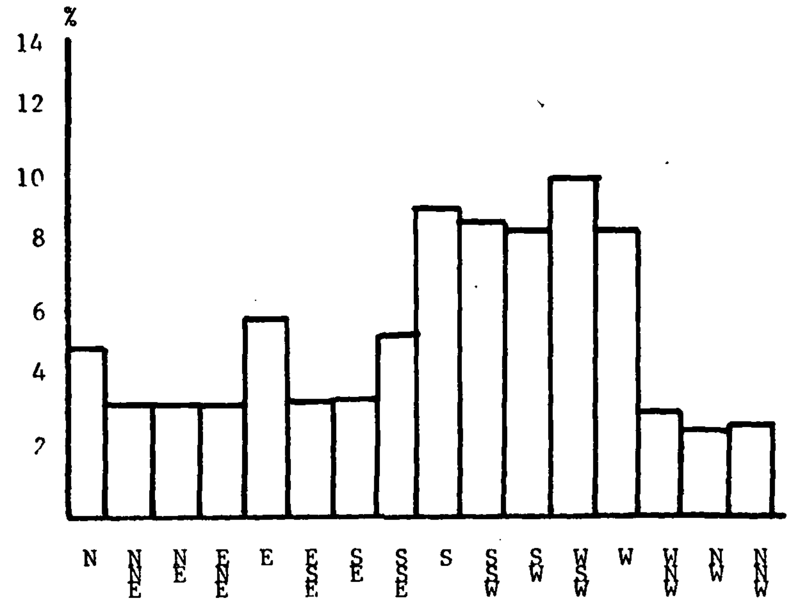
MEAN WIND SPEED ______

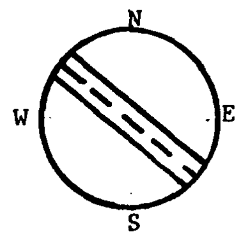
EXTREME WIND SPEED 55

FIG 4-4

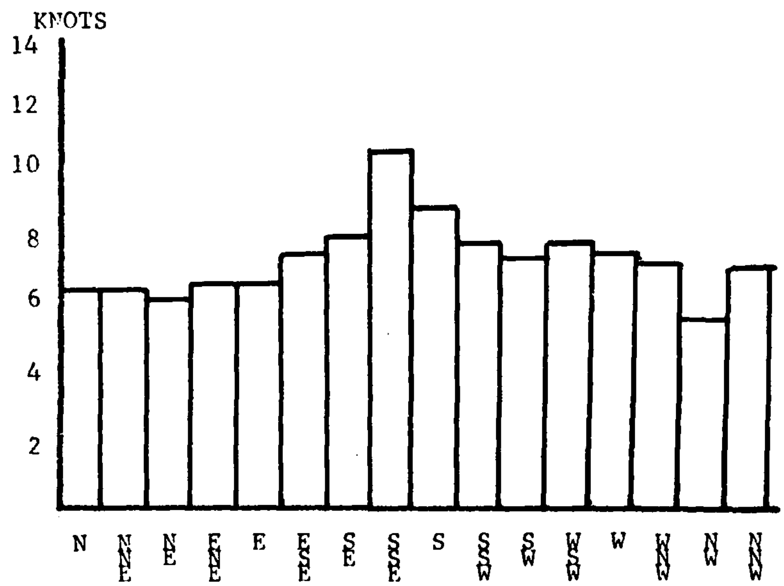
MAY

DIRECTION
PERCENTAGE FREQ.





WIND SPEEDS
MEAN



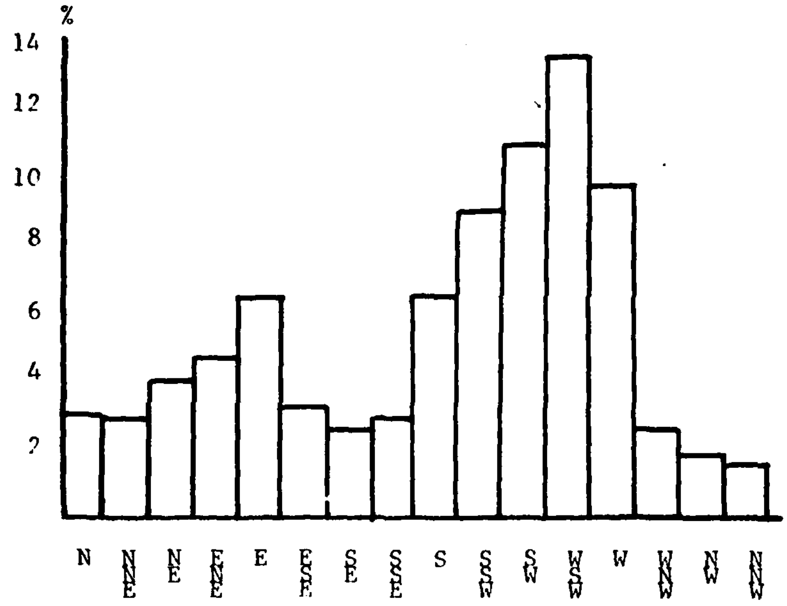
MEAN WIND SPEED 6.7

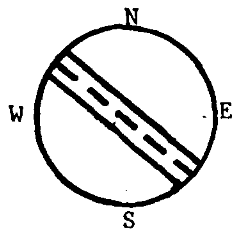
EXTREME WIND SPEED 52

FIG 4-5

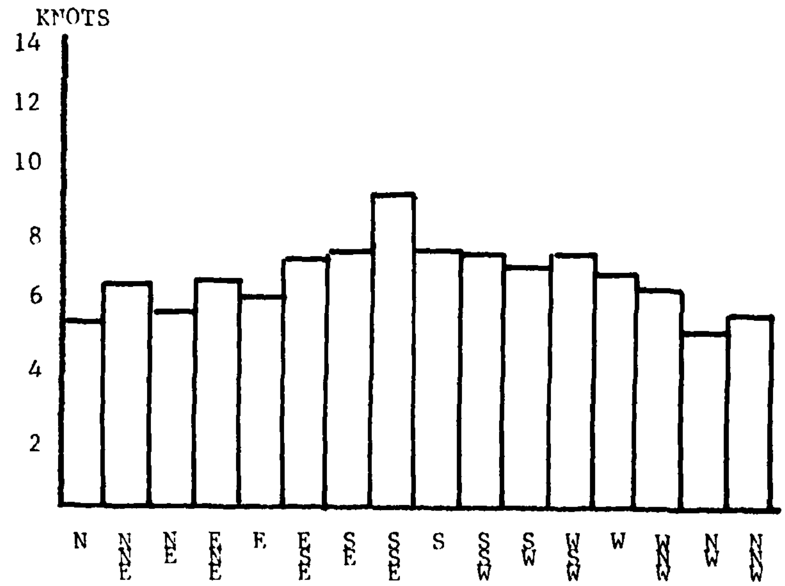
JUNE

DIRECTION
PERCENTAGE FREQ.





WIND SPEEDS
MEAN



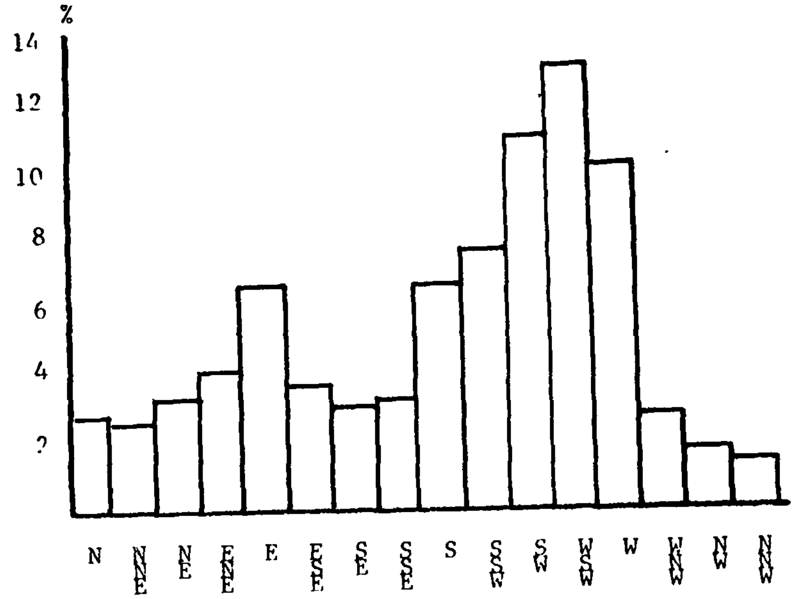
MEAN WIND SPEED 6.0

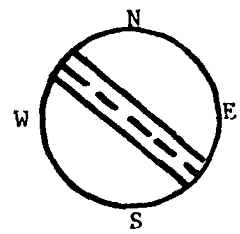
EXTREME WIND SPEED 60

FIG 4-6

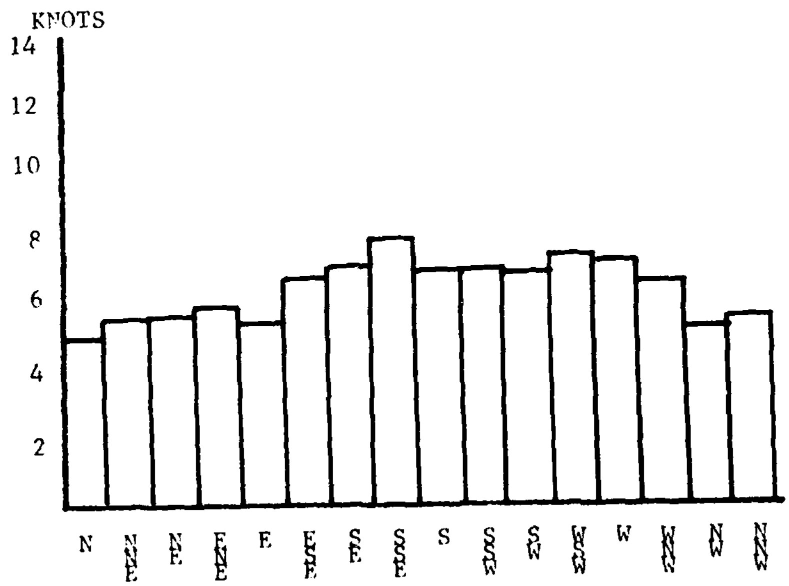
JULY

DIRECTION
PERCENTAGE FREQ.





WIND SPEEDS
MEAN

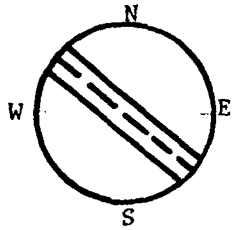


MEAN WIND SPEED 5.5

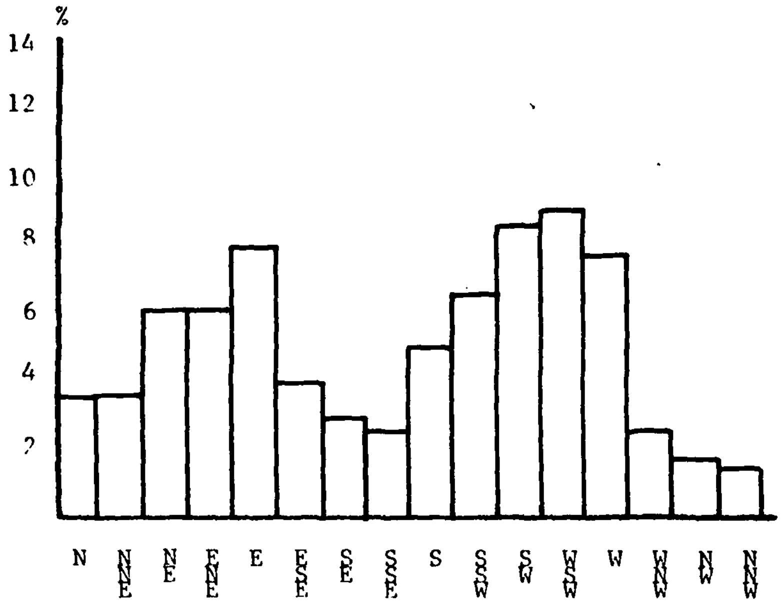
EXTREME WIND SPEED 56

FIG 4-7

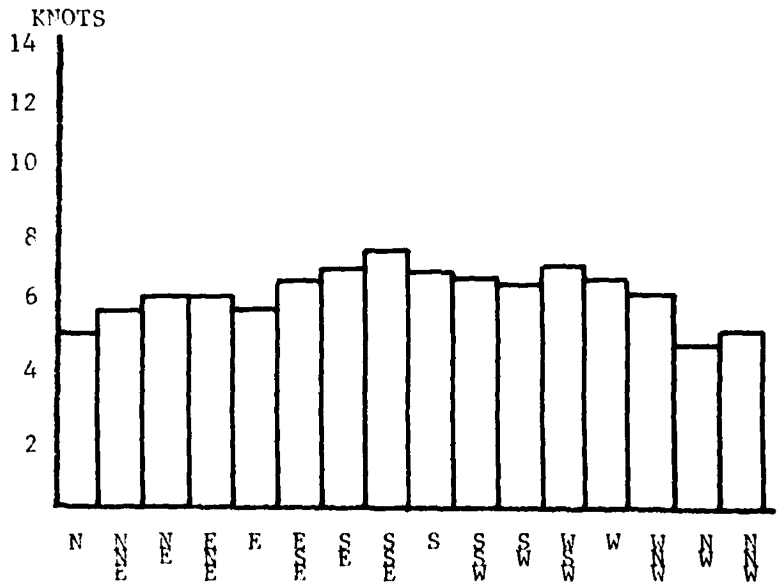
AUGUST



DIRECTION PERCENTAGE FREQ.



WIND SPEEDS MEAN



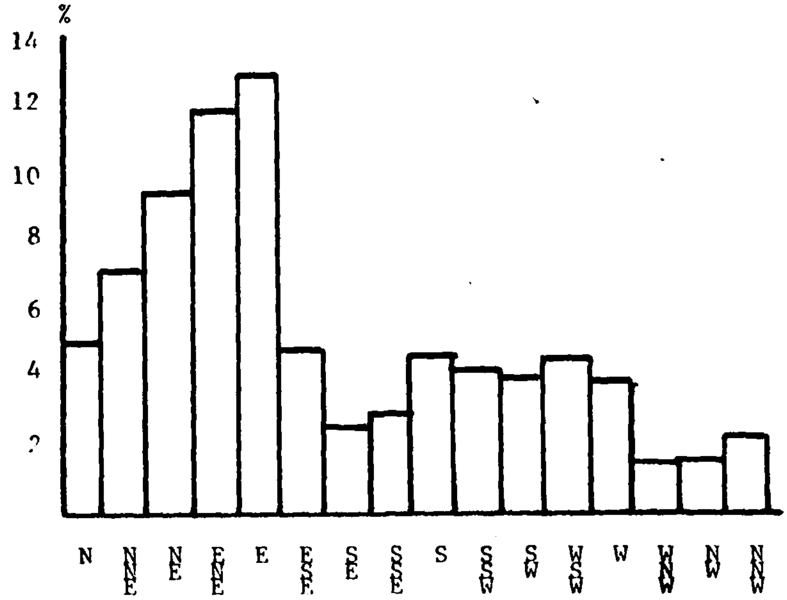
MEAN WIND SPEED 5.1

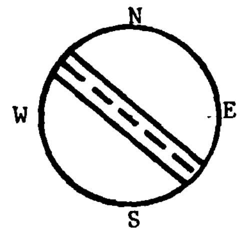
EXTREME WIND SPEED 68

FIG 4-8

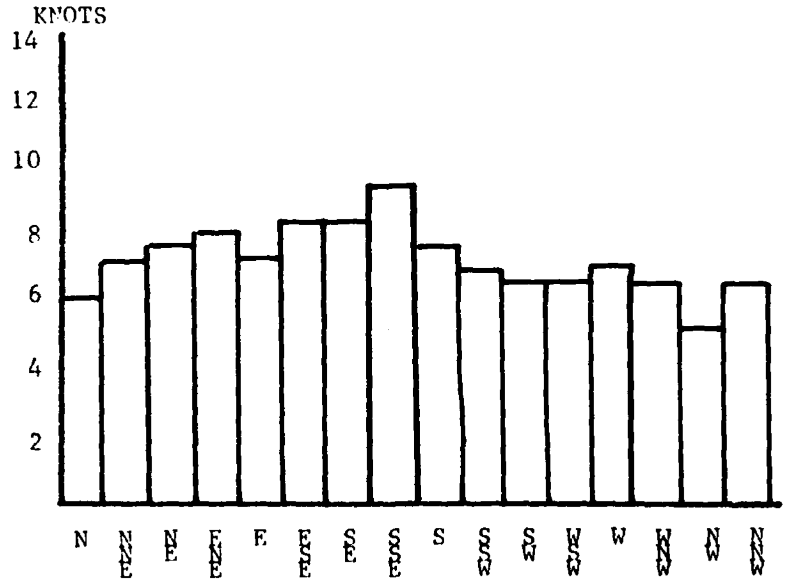
SEPTEMBER

DIRECTION
PERCENTAGE FREQ.





WIND SPEEDS
MEAN



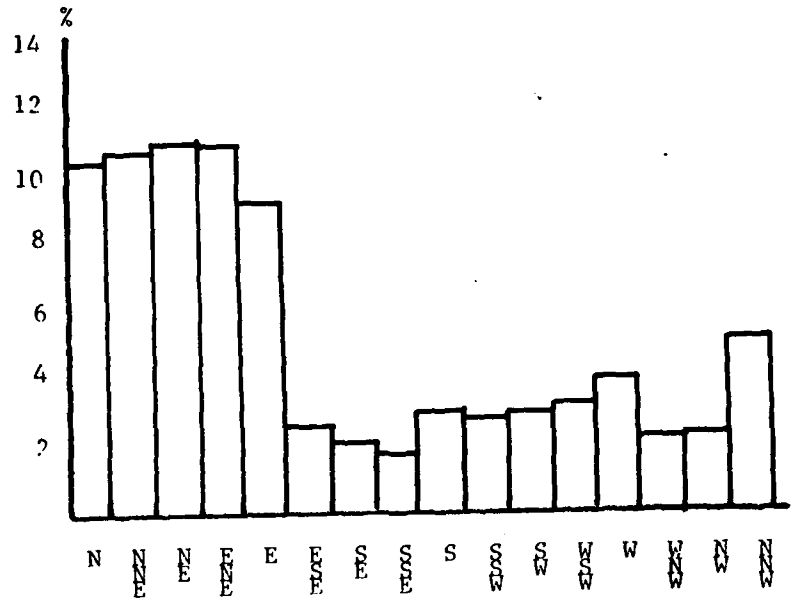
MEAN WIND SPEED 6.2

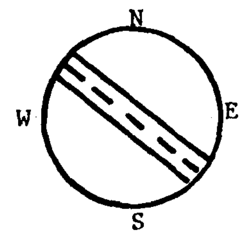
EXTREME WIND SPEED 69

FIG 4-9

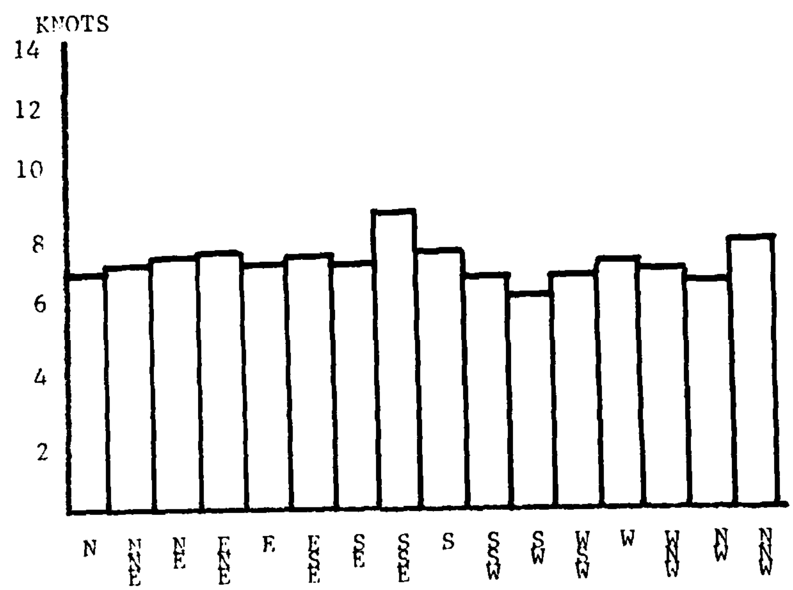
OCTOBER

DIRECTION
PERCENTAGE FREQ.





WIND SPEEDS
MEAN



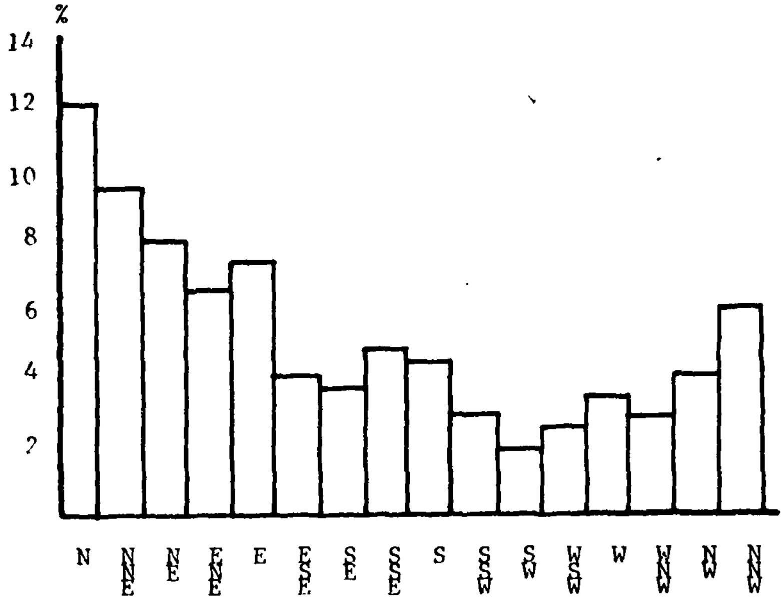
MEAN WIND SPEED 6.3

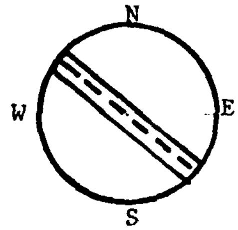
EXTREME WIND SPEED 43

FIG 4-10

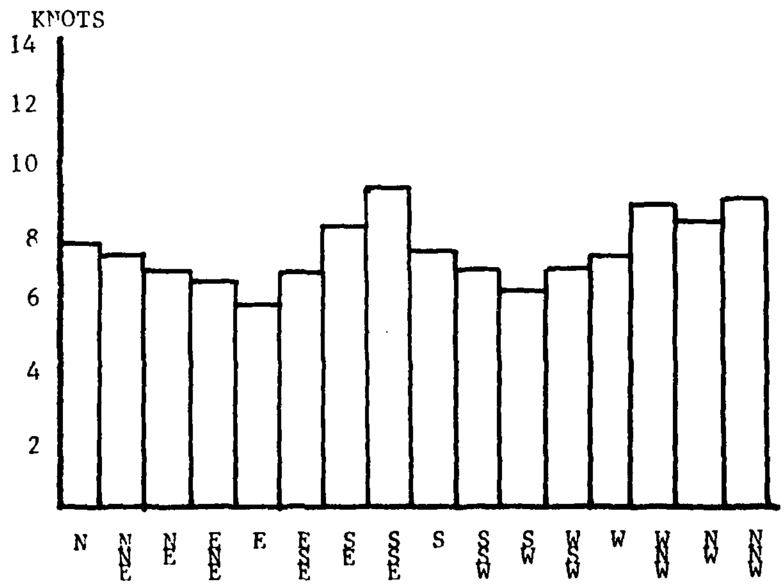
NOVEMBER

DIRECTION
PERCENTAGE FREQ.





WIND SPEEDS
MEAN



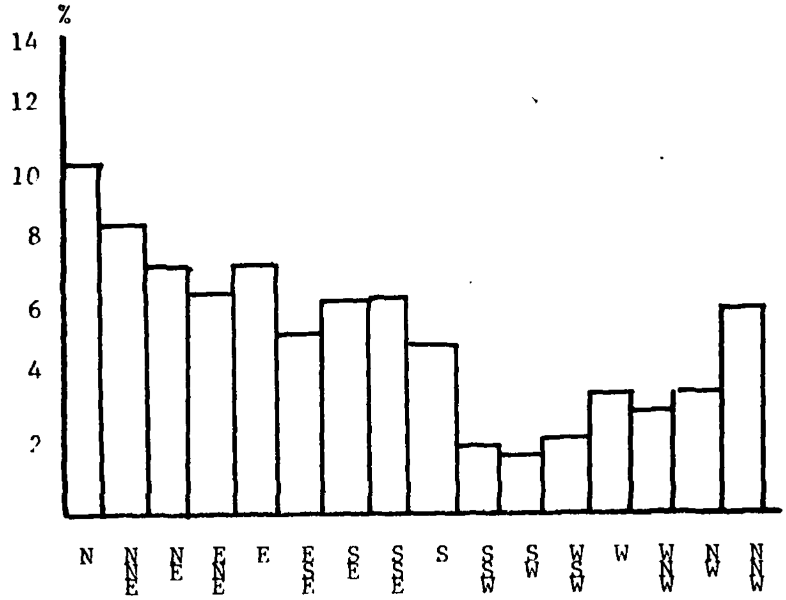
MEAN WIND SPEED 6.

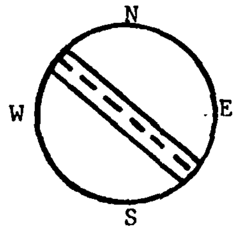
EXTREME WIND SPEED 60

FIG 4-11

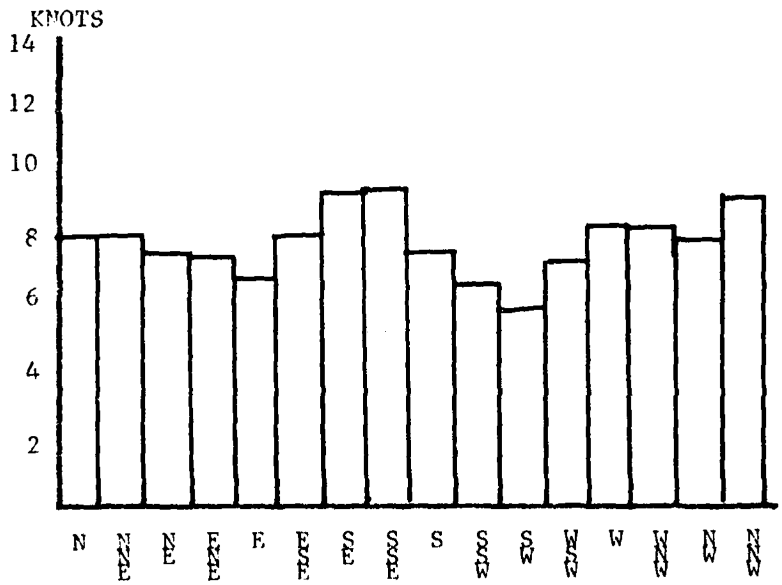
DECEMBER

DIRECTION
PERCENTAGE FREQ.





WIND SPEEDS
MEAN



MEAN WIND SPEED 6.9

EXTREME WIND SPEED 46

FIG 4-12

DEPARTURE OF STATION PRESSURE FROM MEAN BY HOUR

FOR JAN

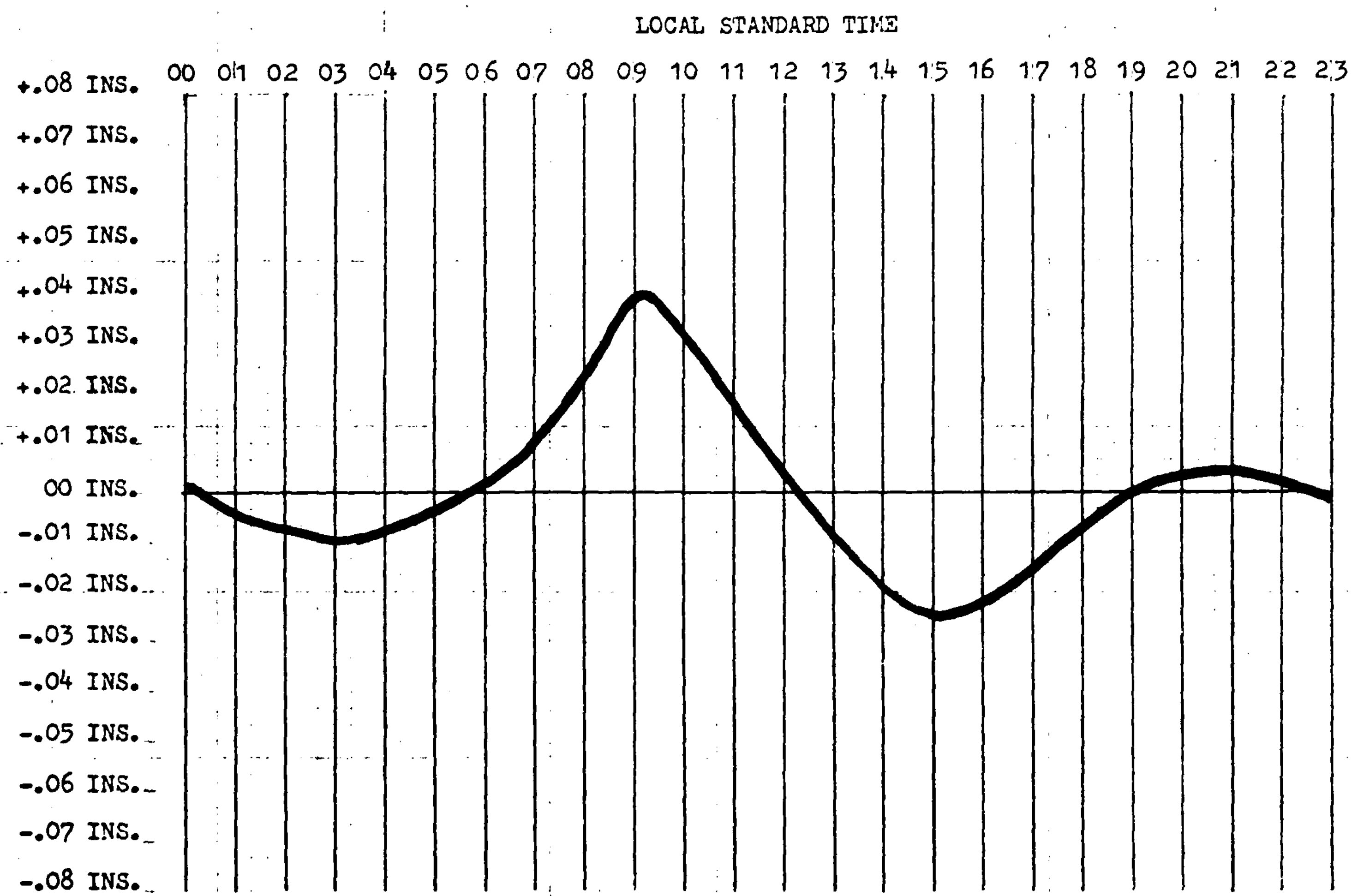


FIG 4-13

DEPARTURE OF STATION PRESSURE FROM MEAN BY HOUR

FOR **FEB**

LOCAL STANDARD TIME

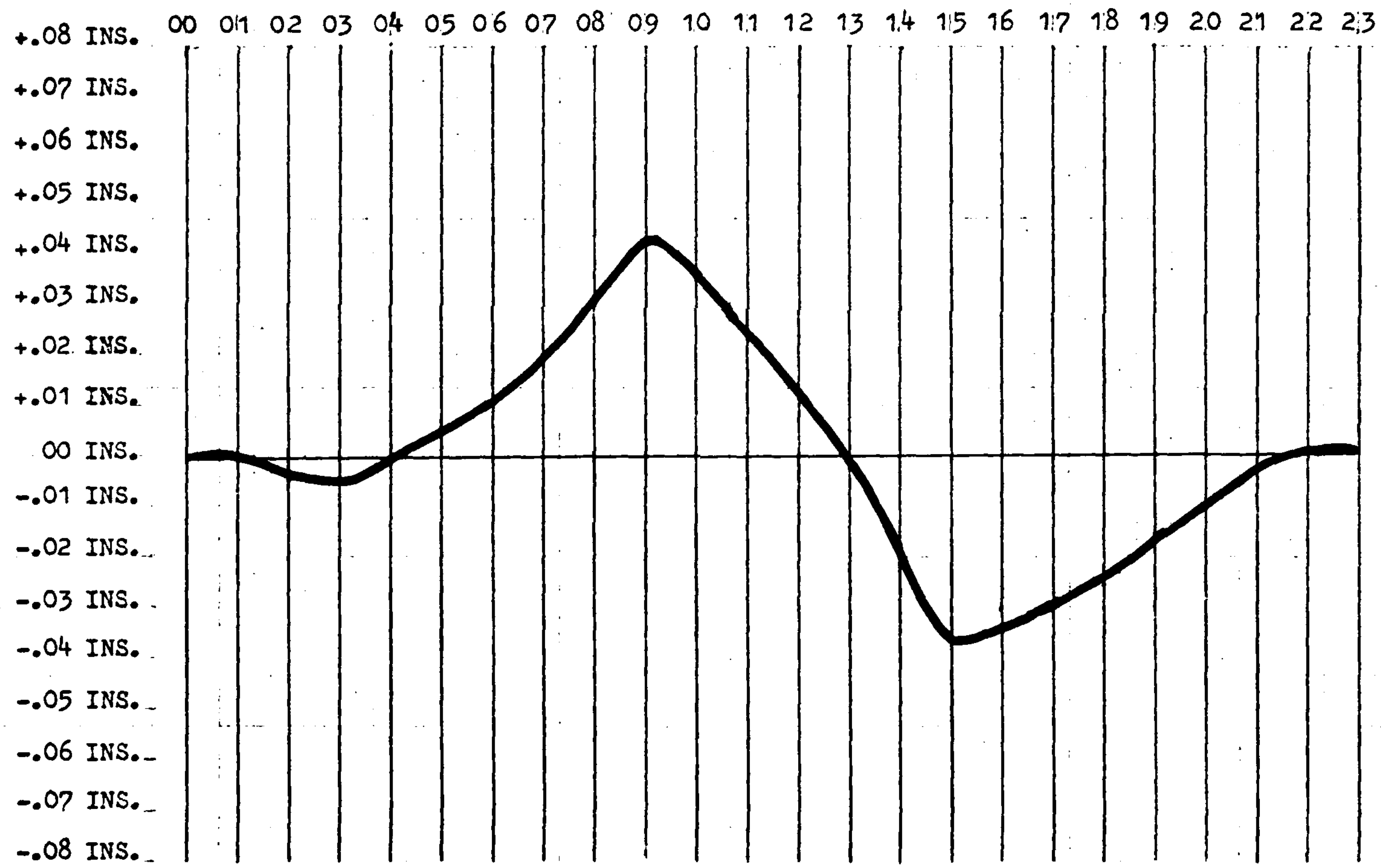


FIG 4-14

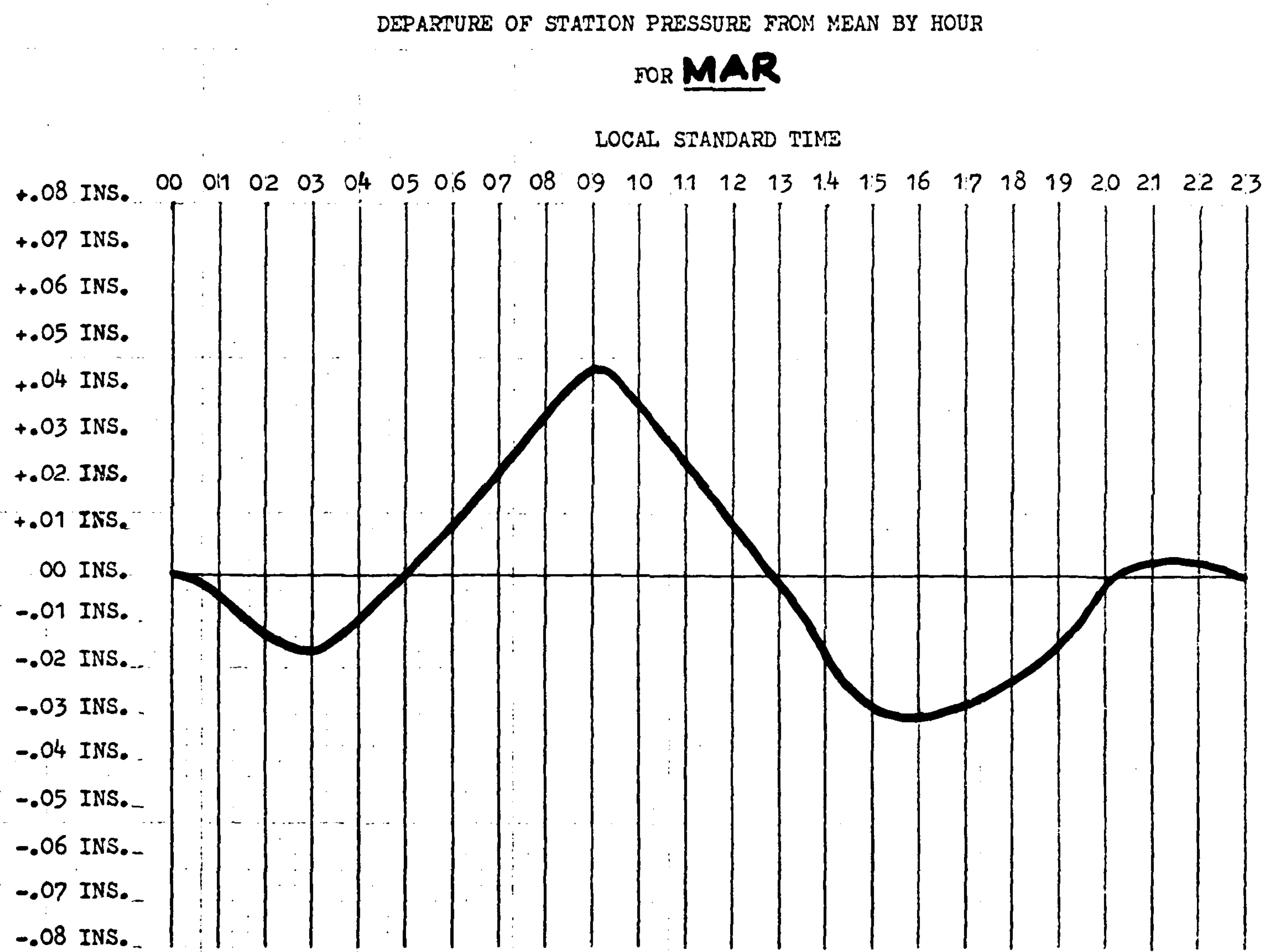

DEPARTURE OF STATION PRESSURE FROM MEAN BY HOUR
FOR MAR
LOCAL STANDARD TIME
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
+.08 INS.
+.07 INS.
+.06 INS.
+.05 INS.
+.04 INS.
+.03 INS.
+.02 INS.
+.01 INS.
00 INS.
-.01 INS.
-.02 INS.
-.03 INS.
-.04 INS.
-.05 INS.
-.06 INS.
-.07 INS.
-.08 INS.

FIG 4-15

DEPARTURE OF STATION PRESSURE FROM MEAN BY HOUR

FOR **APR**

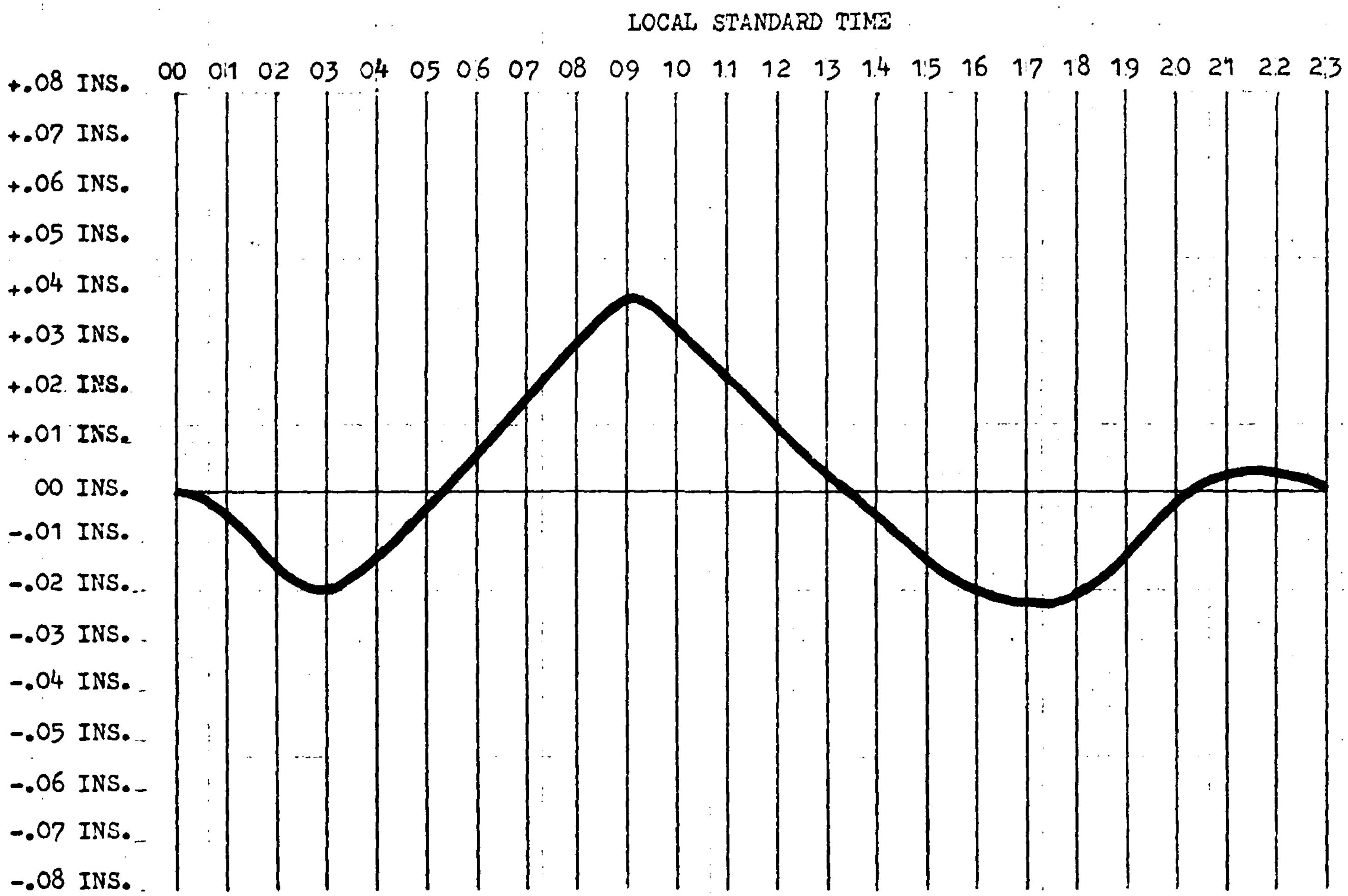


FIG 4-16

DEPARTURE OF STATION PRESSURE FROM MEAN BY HOUR

FOR MAY

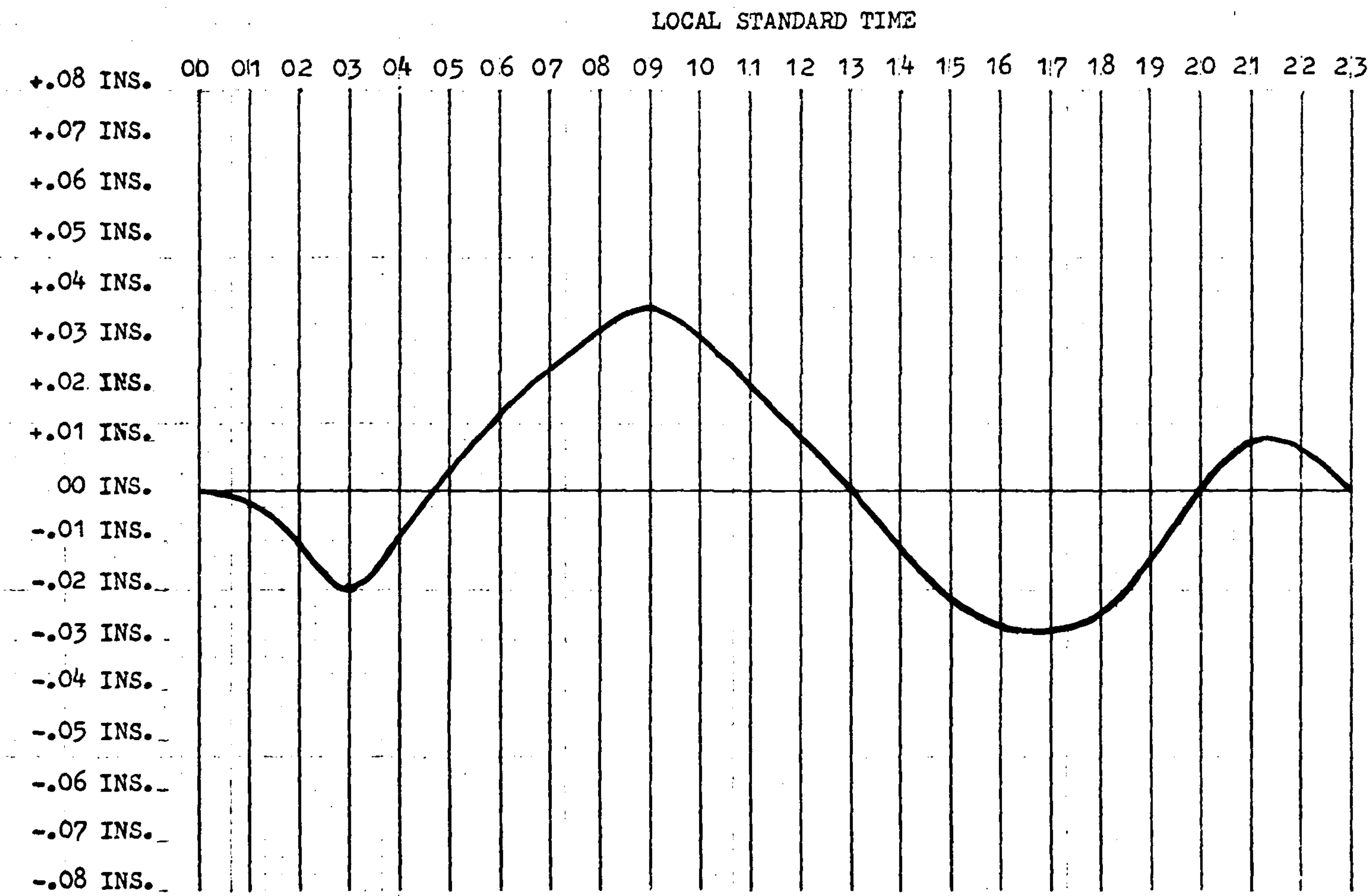


FIG 4-17

DEPARTURE OF STATION PRESSURE FROM MEAN BY HOUR

FOR JUN

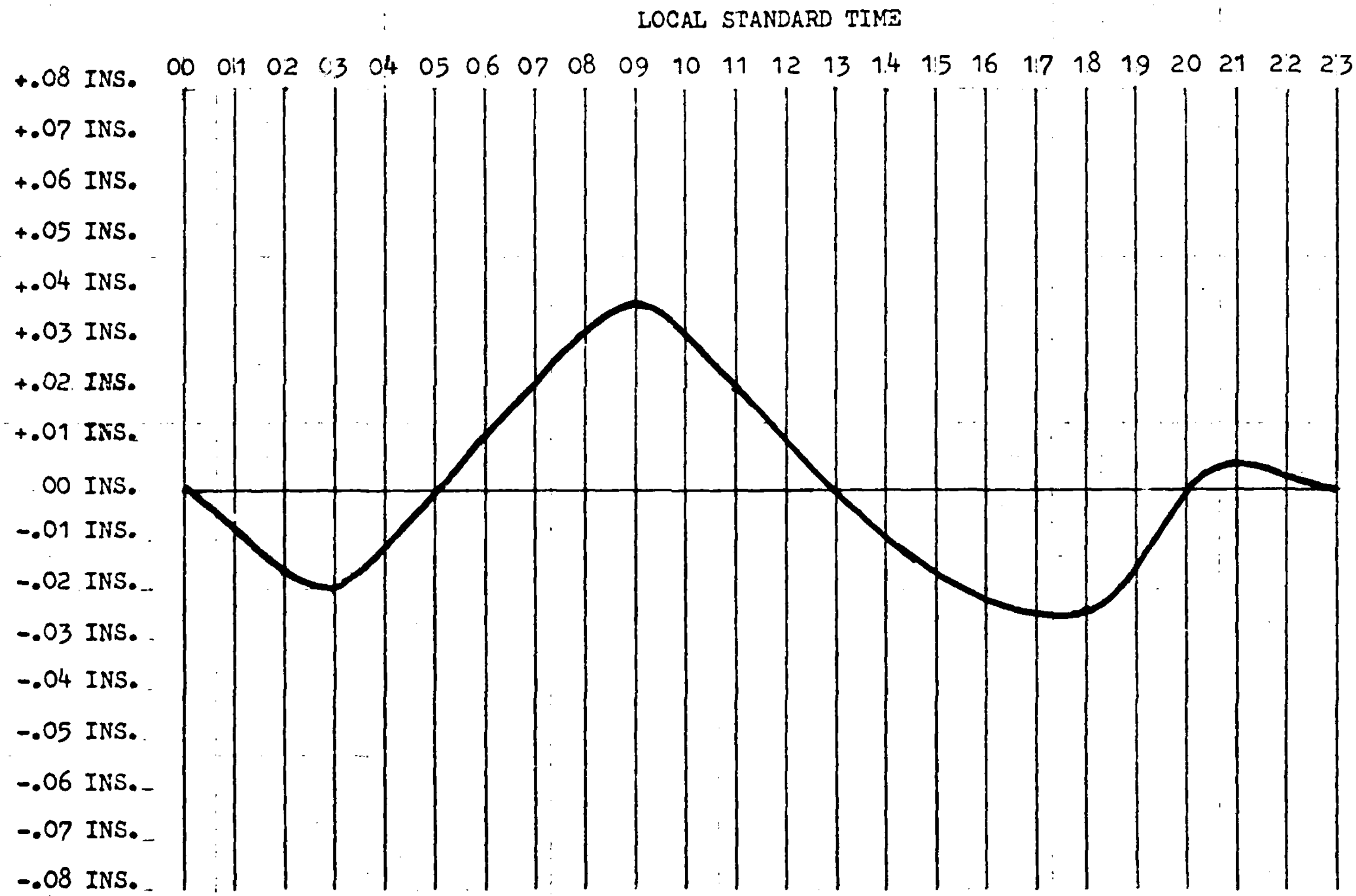


FIG 4-18

DEPARTURE OF STATION PRESSURE FROM MEAN BY HOUR

FOR JUL

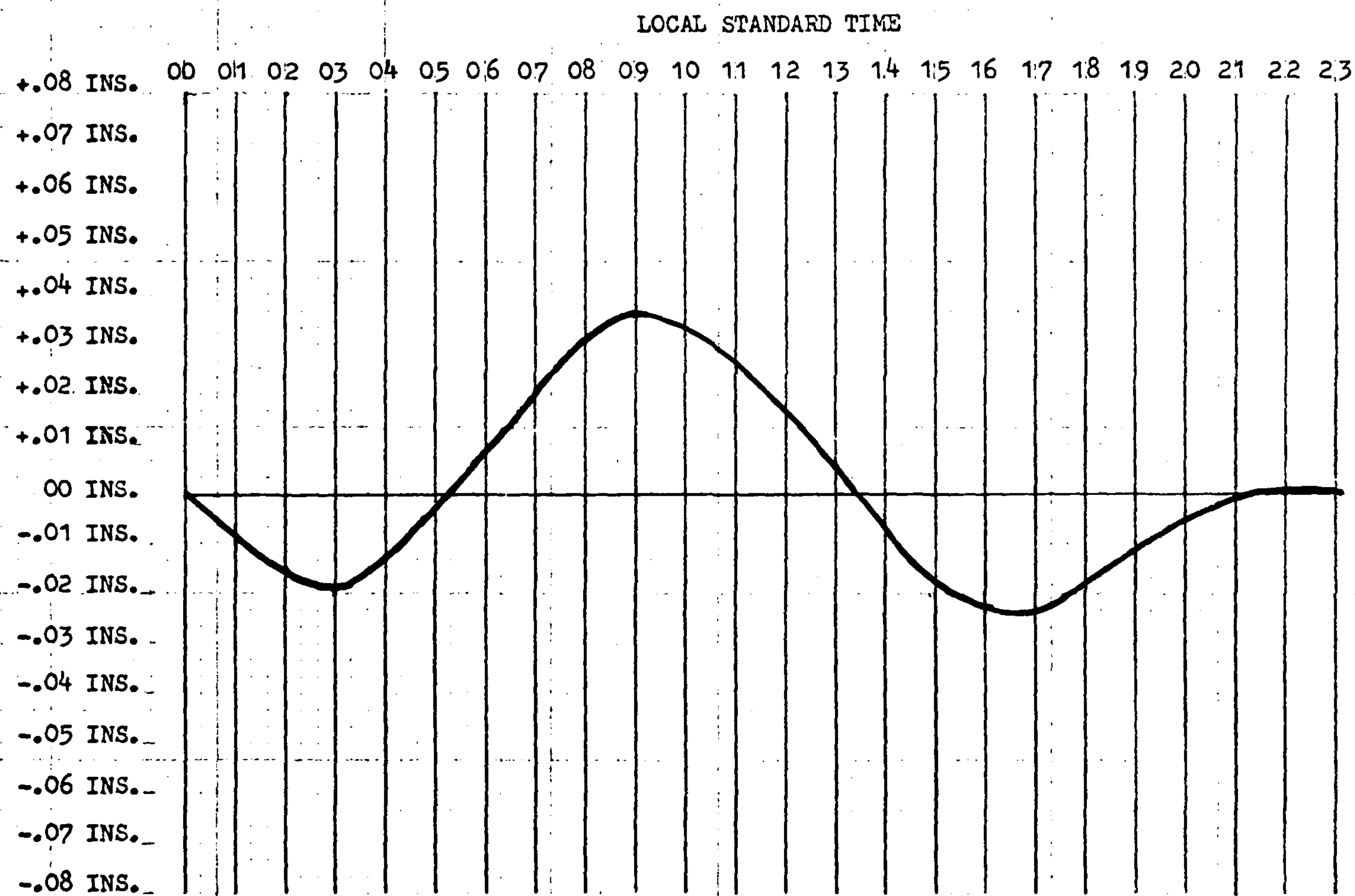


FIG 4-19

DEPARTURE OF STATION PRESSURE FROM MEAN BY HOUR

FOR AUG

LOCAL STANDARD TIME

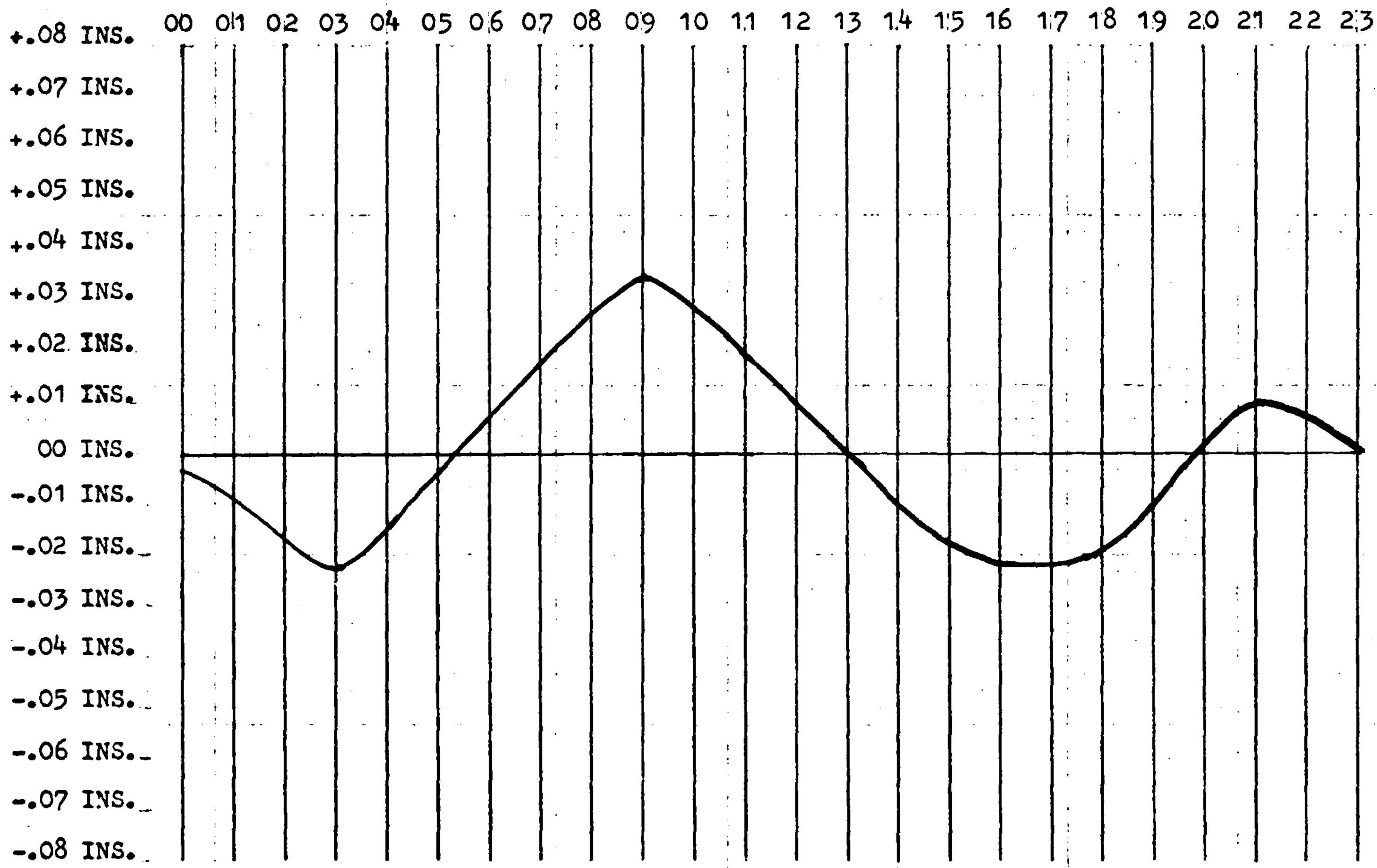


FIG 4-20

DEPARTURE OF STATION PRESSURE FROM MEAN BY HOUR

FOR SEPT

LOCAL STANDARD TIME

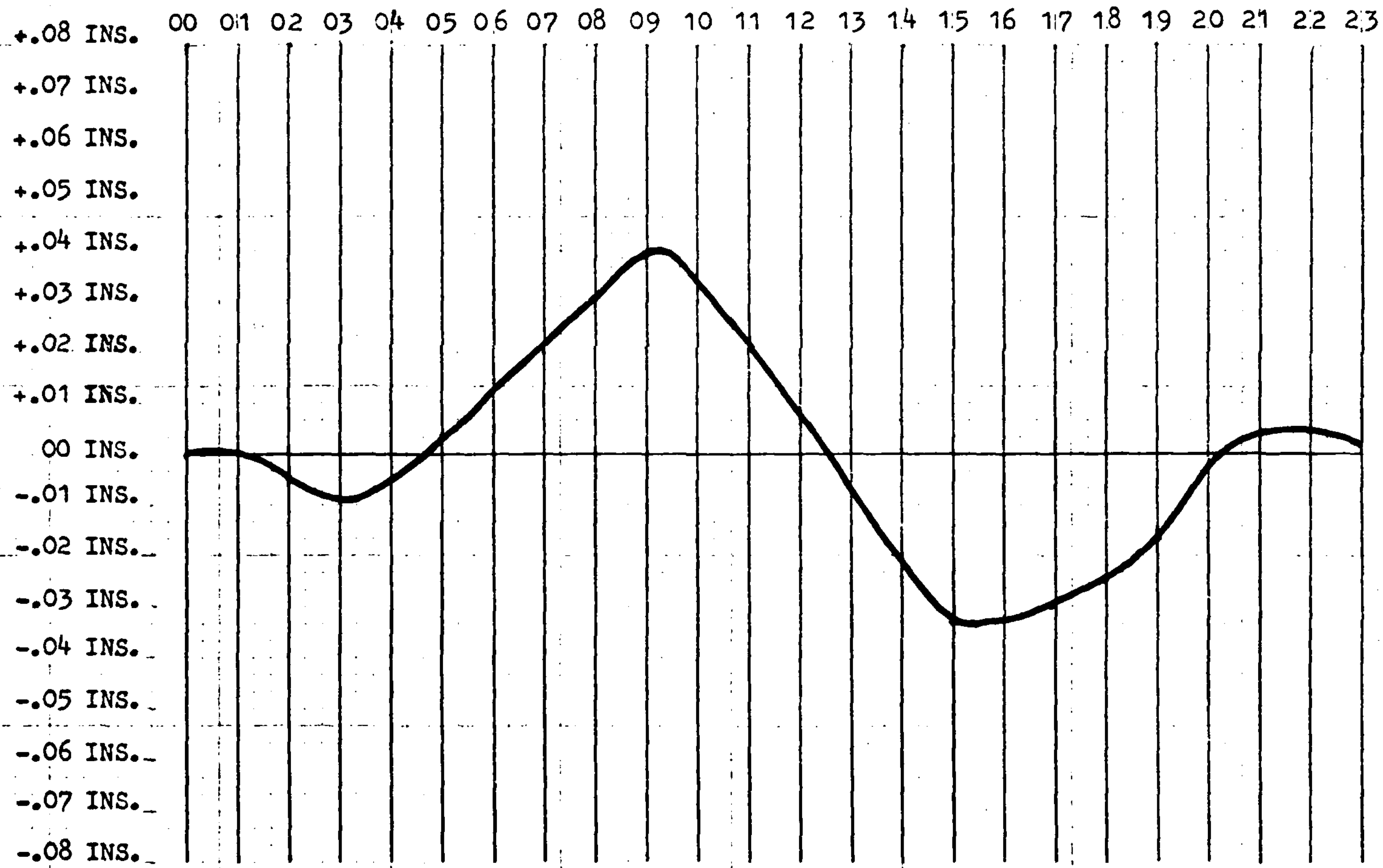


FIG 4-21

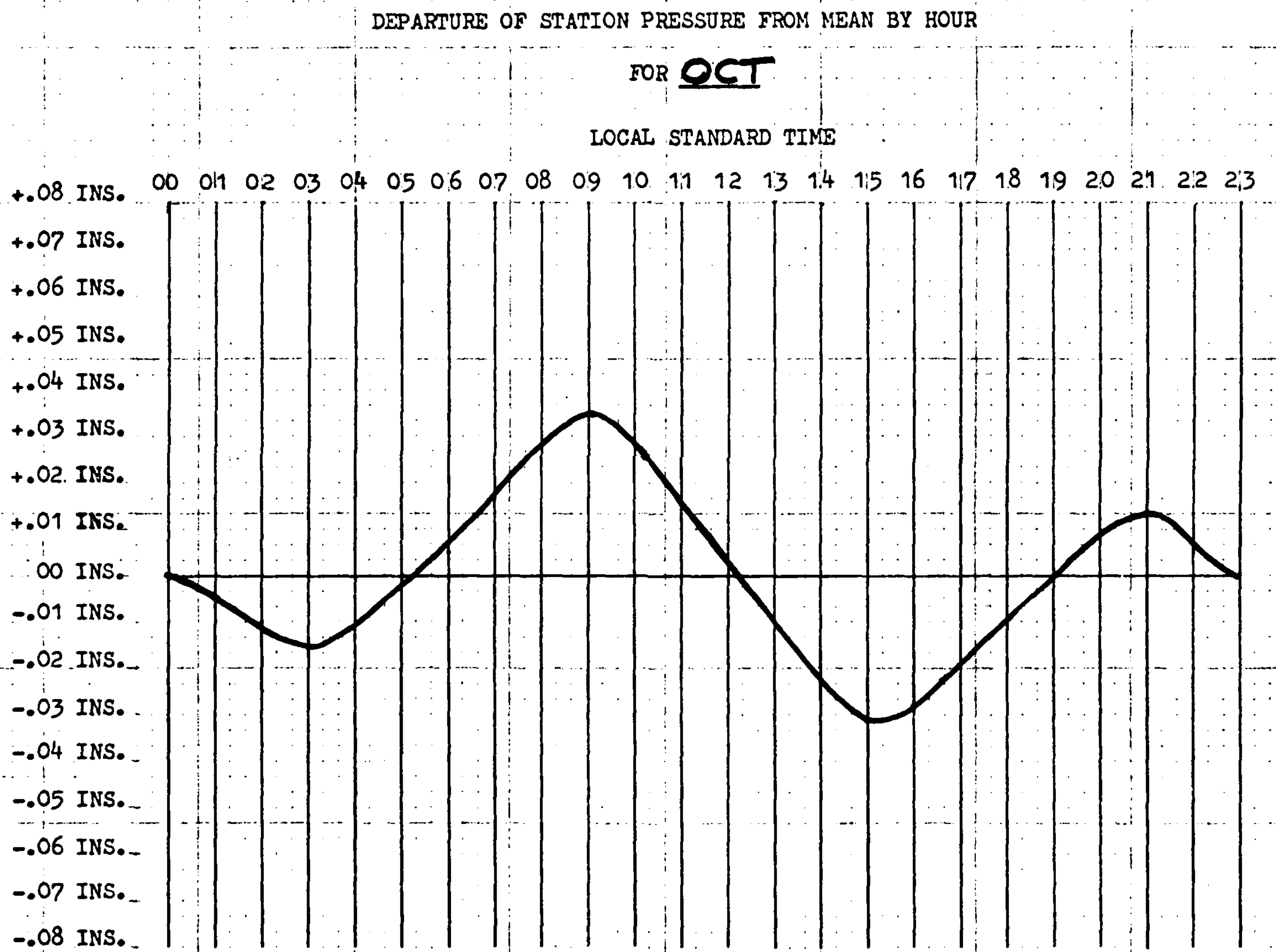

DEPARTURE OF STATION PRESSURE FROM MEAN BY HOUR
FOR OCT
LOCAL STANDARD TIME
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
+.08 INS.
+.07 INS.
+.06 INS.
+.05 INS.
+.04 INS.
+.03 INS.
+.02 INS.
+.01 INS.
00 INS.
-.01 INS.
-.02 INS.
-.03 INS.
-.04 INS.
-.05 INS.
-.06 INS.
-.07 INS.
-.08 INS.

FIG 4-22

DEPARTURE OF STATION PRESSURE FROM MEAN BY HOUR

FOR NOV

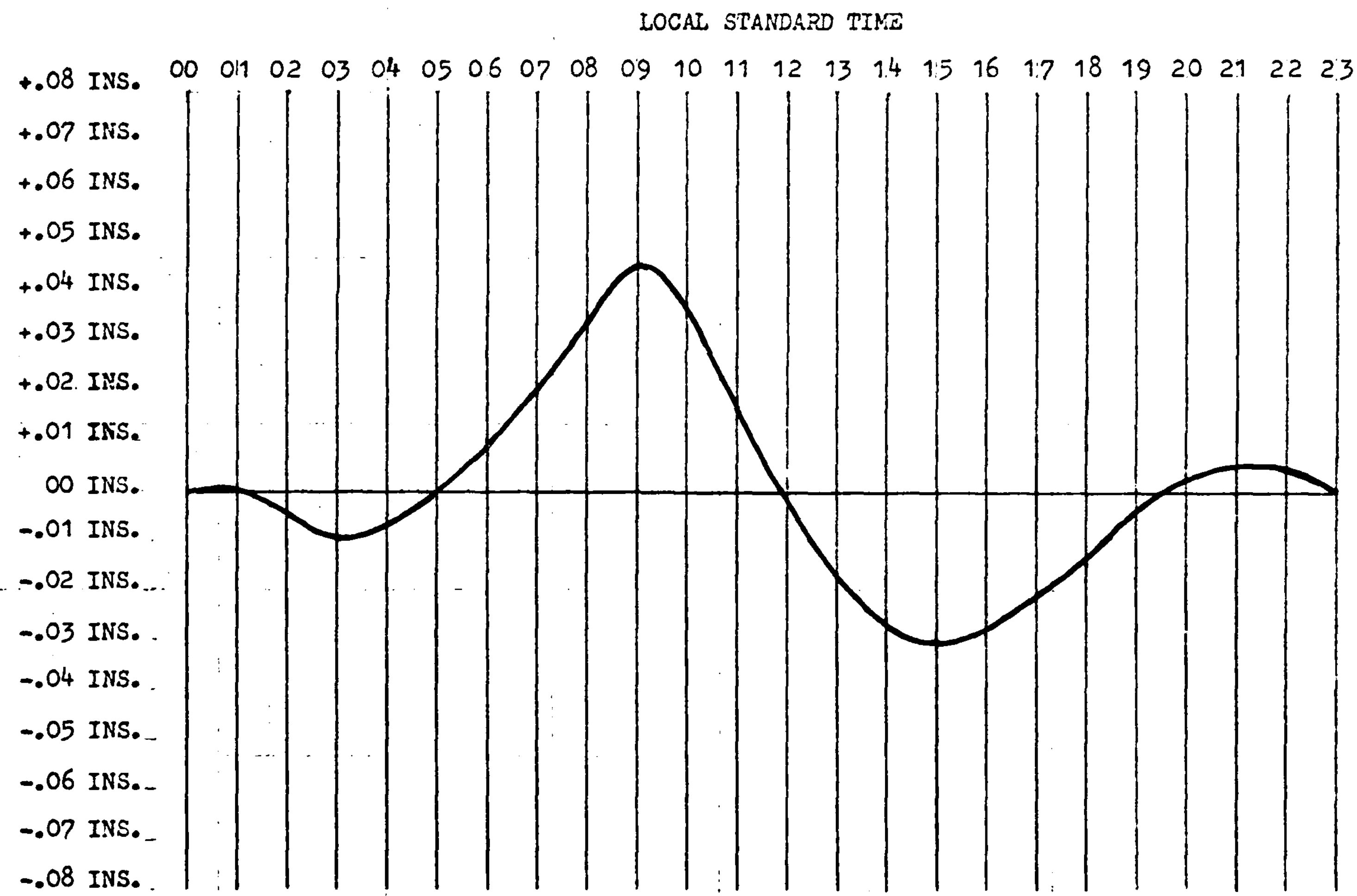


FIG 4-23

DEPARTURE OF STATION PRESSURE FROM MEAN BY HOUR

FOR DEC

LOCAL STANDARD TIME

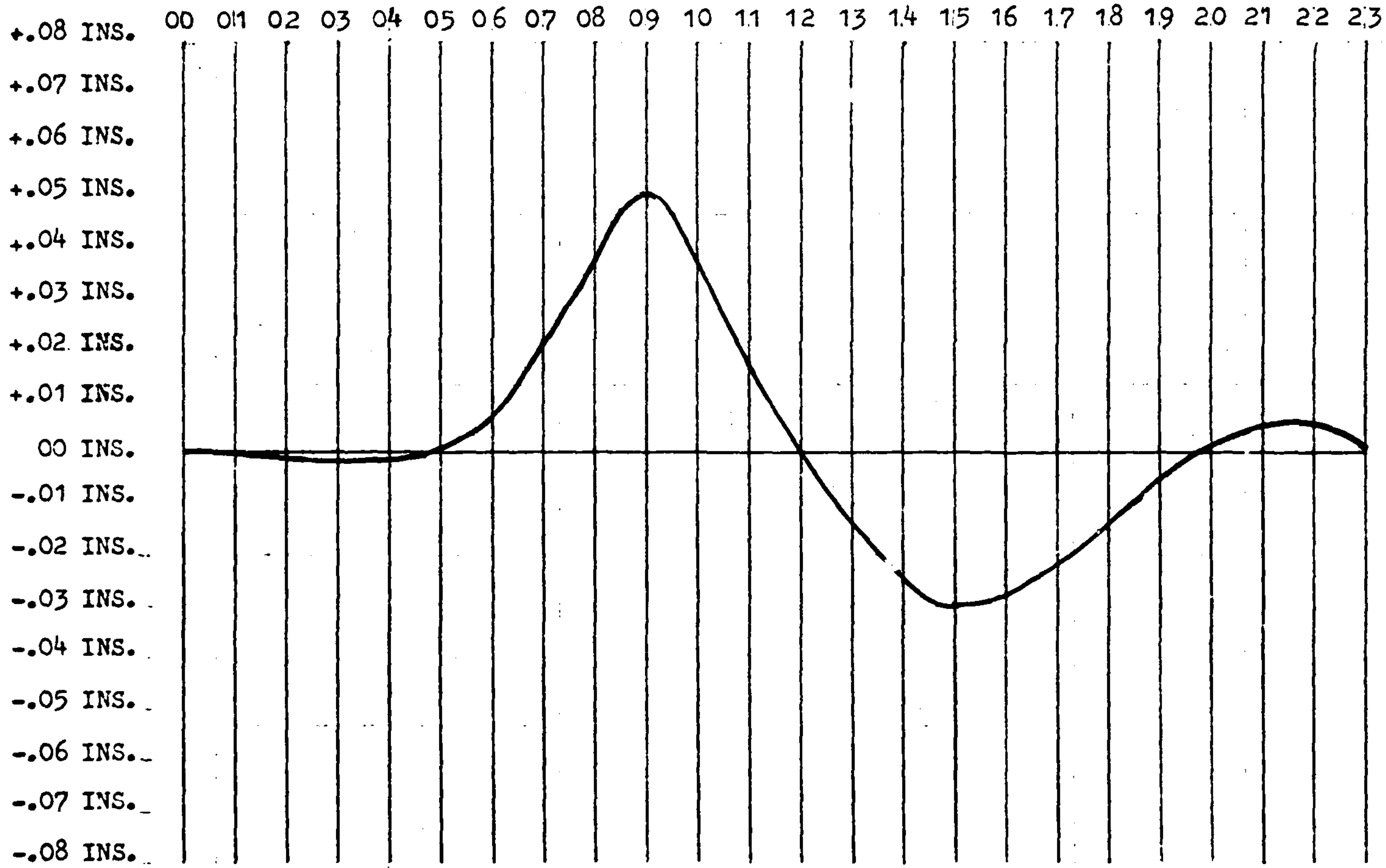


FIG 4-24

HURRICANE TRACKS for AUGUST

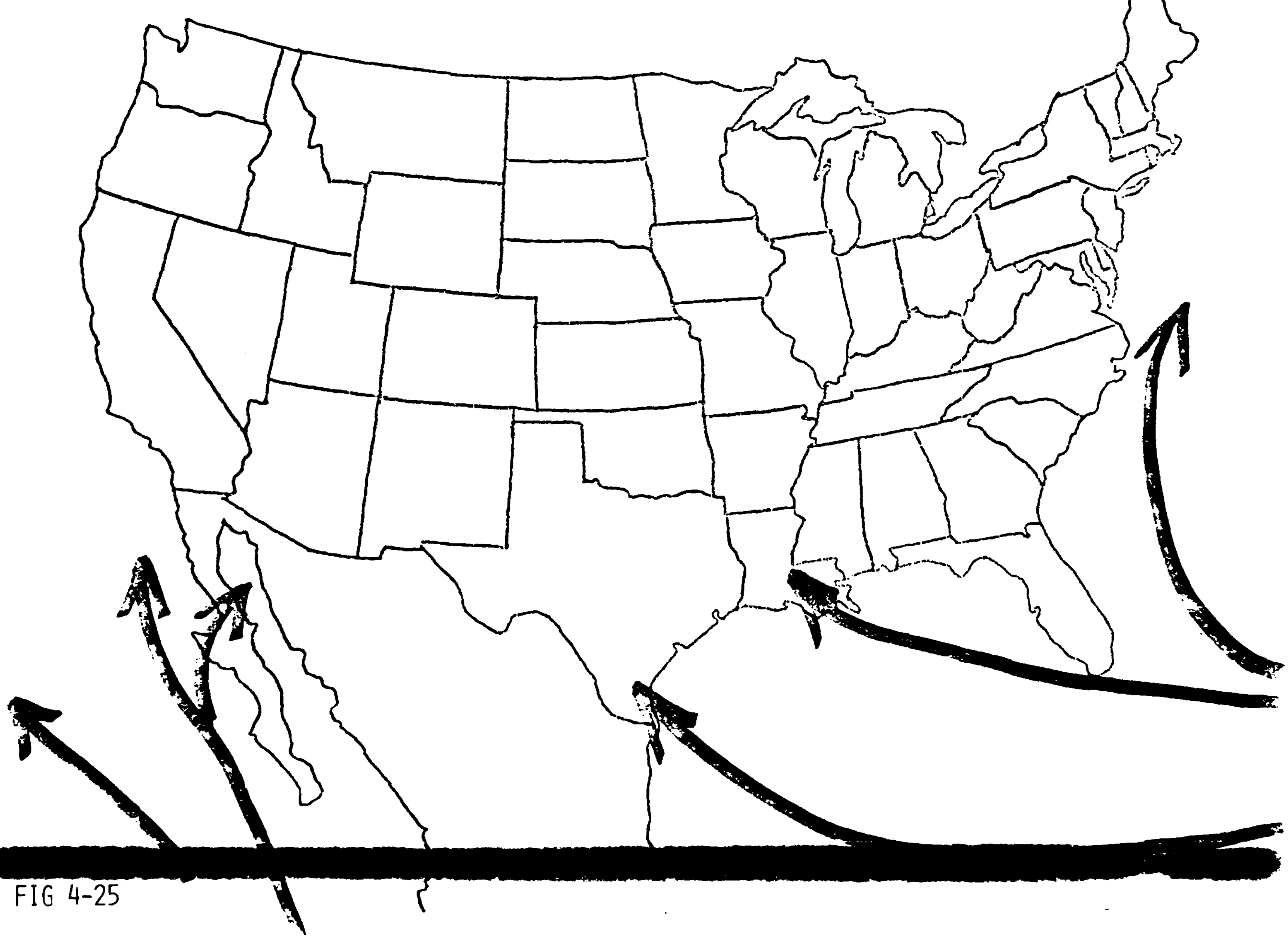


FIG 4-25

HURRICANE TRACKS for SEPTEMBER

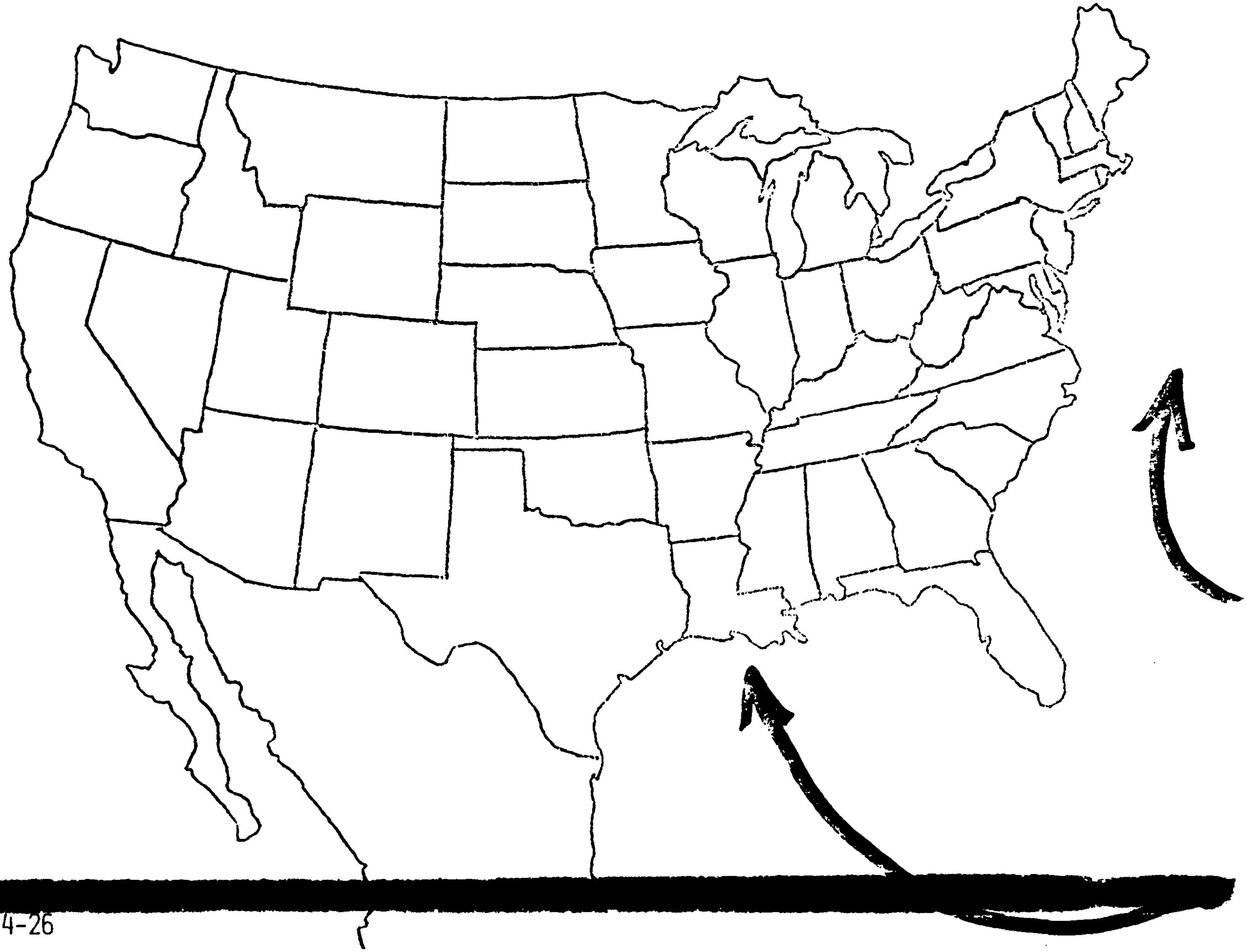


FIG 4-26

HURRICANE TRACKS for OCTOBER

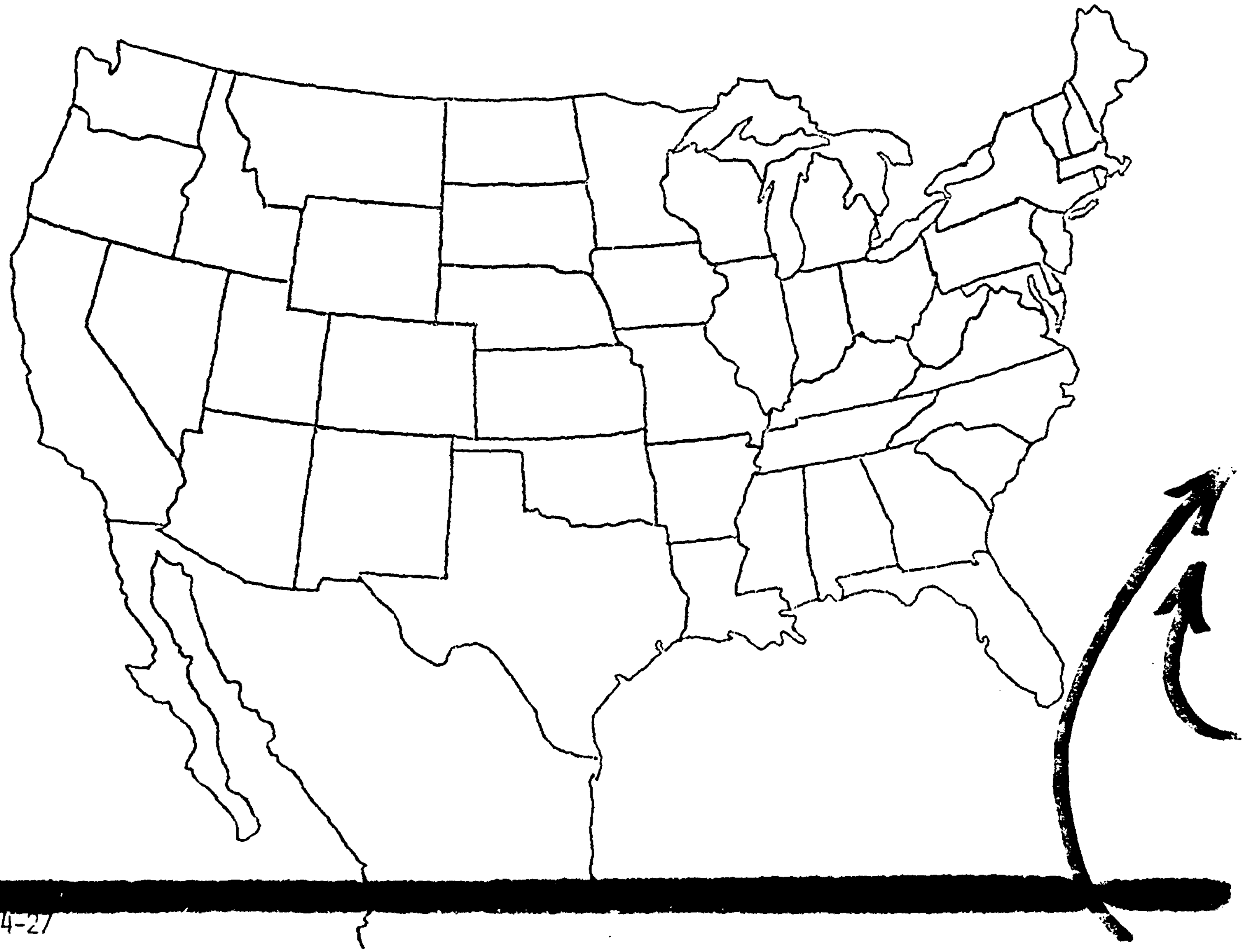


FIG 4-27

HURRICANE TRACKS for NOVEMBER

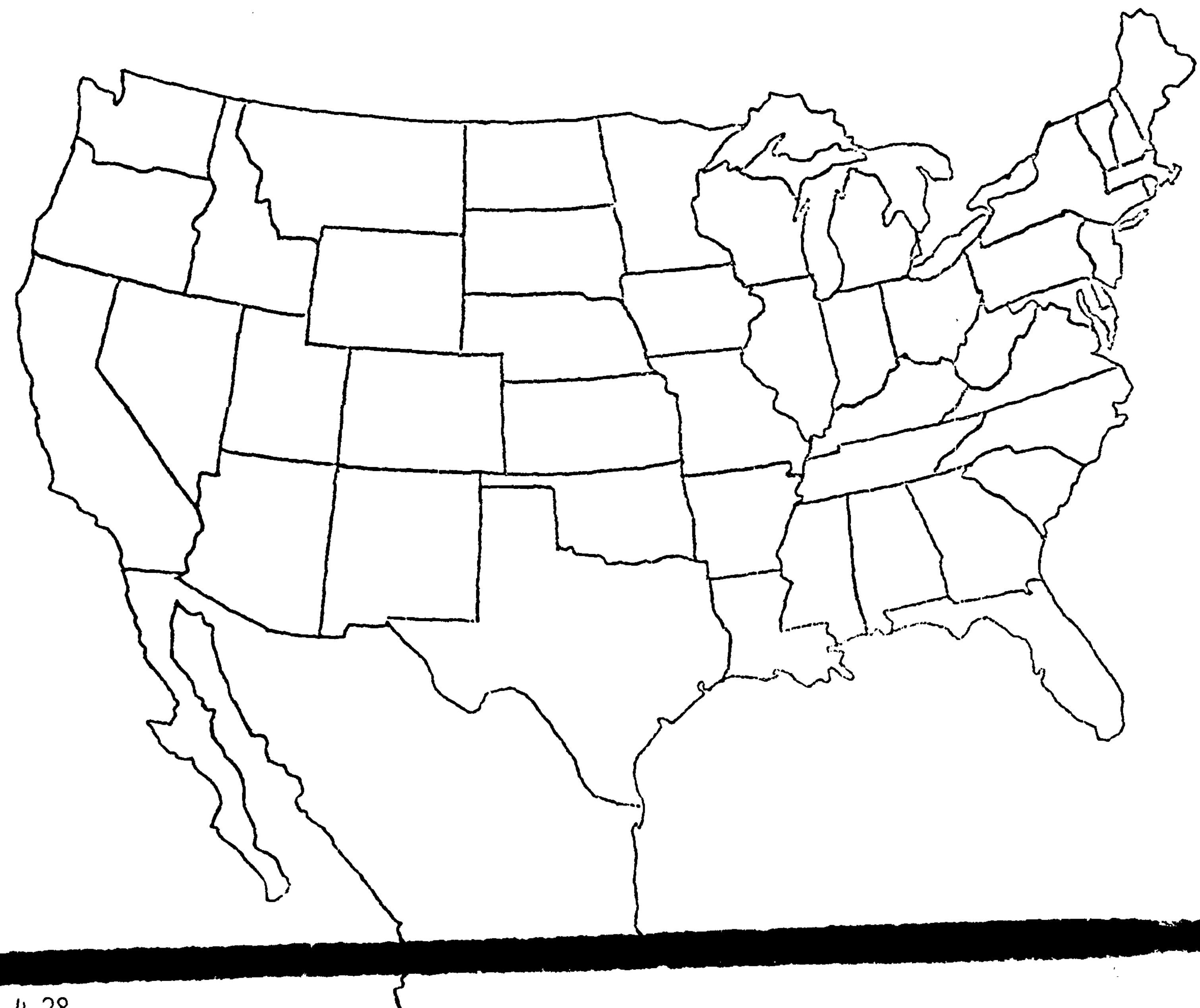


FIG 4-28

A Climatology of Monthly Mean Sea Surface
Temperature for the Gulf of Mexico

Introduction

This report presents charts of monthly mean sea-surface temperatures in unanalyzed form for the Gulf of Mexico. The National Climatic Center at Asheville, North Carolina, provided the data in the form of computer produced worksheets which had been used in preparing the U.S. Navy Marine Climatic Atlas of the World, Volume One, North Atlantic Ocean (Dec 1974). Each chart (Figures 1-12) is a Mercator projection covering the area 18°N-31°N and 79°W-98°W. The plotted values represent the mean sea-surface temperature in degrees Celsius and an observation count indicator for the one degree quadrangles in which the temperatures are plotted.

Discussion

This climatology is based on observations taken from commercial and military ships during a period from 1854 to 1973. Each monthly chart represents approximately 85,000 observations. The observation count, which ranges from none in some areas to over 3,000 per one degree quadrangle in heavily traveled shipping lanes, is categorized as follows:

Number of Observations	Category
0-9	A
10-99	B
100-999	C
1000-1999	D
2000-2999	E
$\geq$3000	F

The mean temperatures for category A were deleted because less than 10 observations were not considered enough to compute a meaningful average.

According to Rivas (1968) and Saur (1963) the accuracy of the data is controlled by two factors. First, diurnal variations can be as great as 1.2°C for any given location. Second, the accuracy of temperature observations made by commercial and military ships vary in quality.

Sea water temperatures are most commonly read from thermometers located in the sea water intakes in ships' engine rooms. These temperatures are generally known as "injection temperatures." The size, length, and location of the intake pipe and the location of the thermometer in the pipe differ from ship to ship. In some cases, the intake pipes may be located behind overboard discharge pipes; also the ship's load will affect the intake pipe depth. The thermometer may be mounted near the hull or some distance inboard. Incrustation and poor exposure of the thermometer well, combined with coarsely calibrated (sometimes 5°F increments) and incorrectly calibrated thermometers, add to the inaccuracy of observations. Even reporting procedures can cause errors when there is a time lag between recording temperatures on the engine room logs and reporting them on the weather observation.

Other methods of obtaining sea-surface temperatures include bathythermograph observations and bucket observations. The bathythermograph is a recording thermometer for determining both surface and subsurface water temperatures. Bucket observations are made with a thermometer mounted in an insulated container that is dipped into the water. While these temperatures are more precise than injection temperatures, Stevenson (1964) demonstrates that both water and air temperatures are modified in the immediate vicinity of a vessel either anchored or in motion. Rivas (1968) suggests that observational anomalies tend to offset each other when there is a large number of observations taken over a long period of record. However, a U.S. Department of Commerce report (1973) does indicate that daily surface water temperatures may deviate substantially from the means. Some causes of these deviations are hurricane and winter frontal passages, river runoff and ocean currents.

The Loop Current is the primary current in the Gulf of Mexico. Leipper (1970) shows that this current generally follows an annual cycle but it experiences much year to year variability (Figure 13). Its suggested seasonal pattern begins in spring with

a small loop in the southeastern Gulf. The current enters through the Yucatan Strait and curves around Cuba, exiting through the Florida Straits. It penetrates northward in spring, with the rapid northward growth known as the spring intrusion. In summer the current spreads westward with two possible patterns occurring. In one case the entire Loop Current moves westward to the 90°W meridian. In the second case a portion of the loop breaks off from its feeder current and shifts westward. The spreading continues into fall. The loop's intensity weakens such that in winter the primary current is again found in the southeastern Gulf.

Upwelling produces another seasonal effect on Gulf sea-surface temperatures. The only place that significant upwelling occurs is along the northern coast of the Yucatan Peninsula. Upwelling is primarily a summertime phenomena detectable from May through October.

Maul (1976) best describes the entire problem of temperature fluctuations and current variability by suggesting " . . . the entire ocean is dominated by change with a broad spectrum of temporal and spatial scales. Indeed the mean picture of the oceans - the atlas image - may be largely a figment of our mathematics; one should not expect to encounter mean conditions at any given time."

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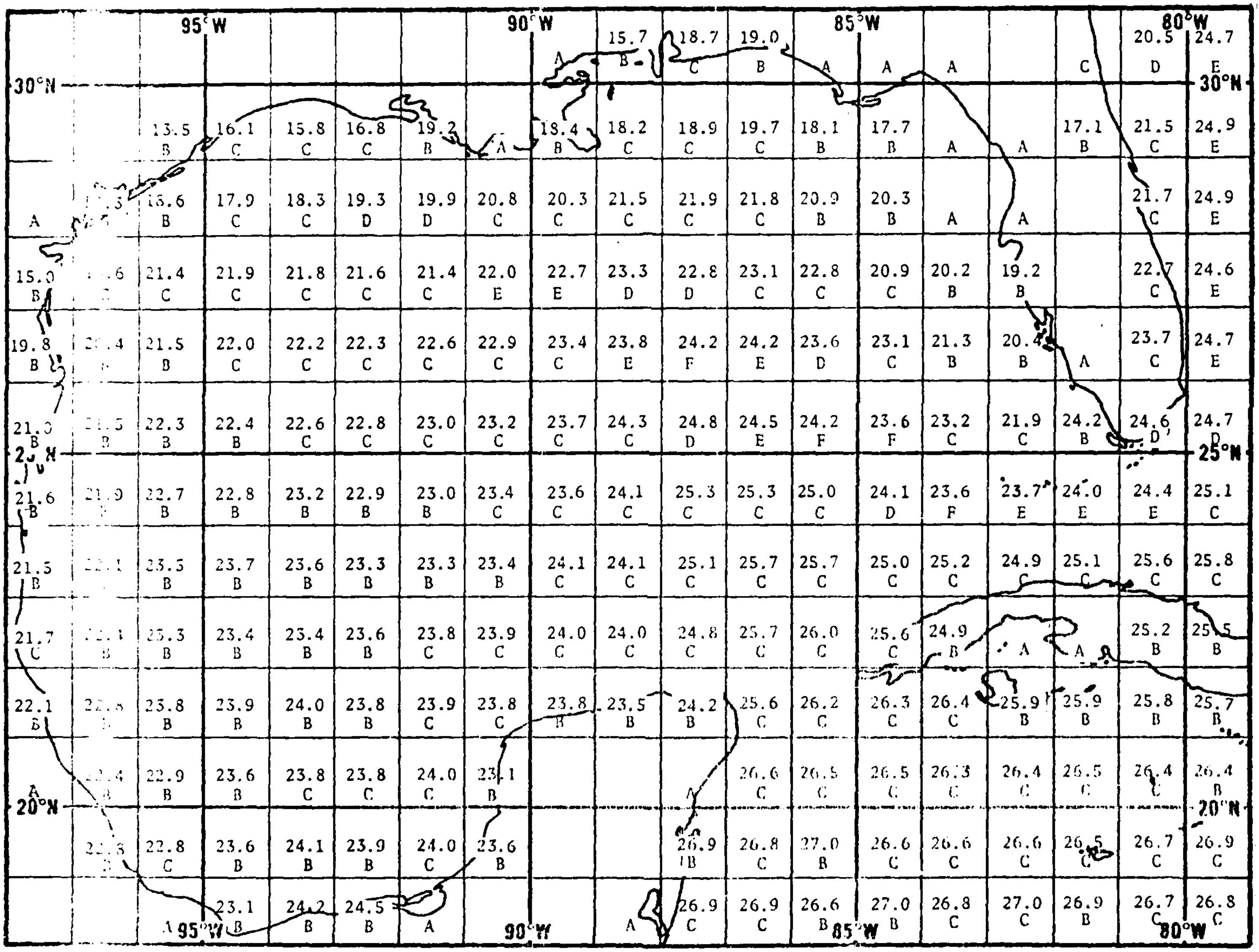


FIG 4-29

Average Sea Surface Temperatures (Numerical Value) and Observation Count (Letter) for January.

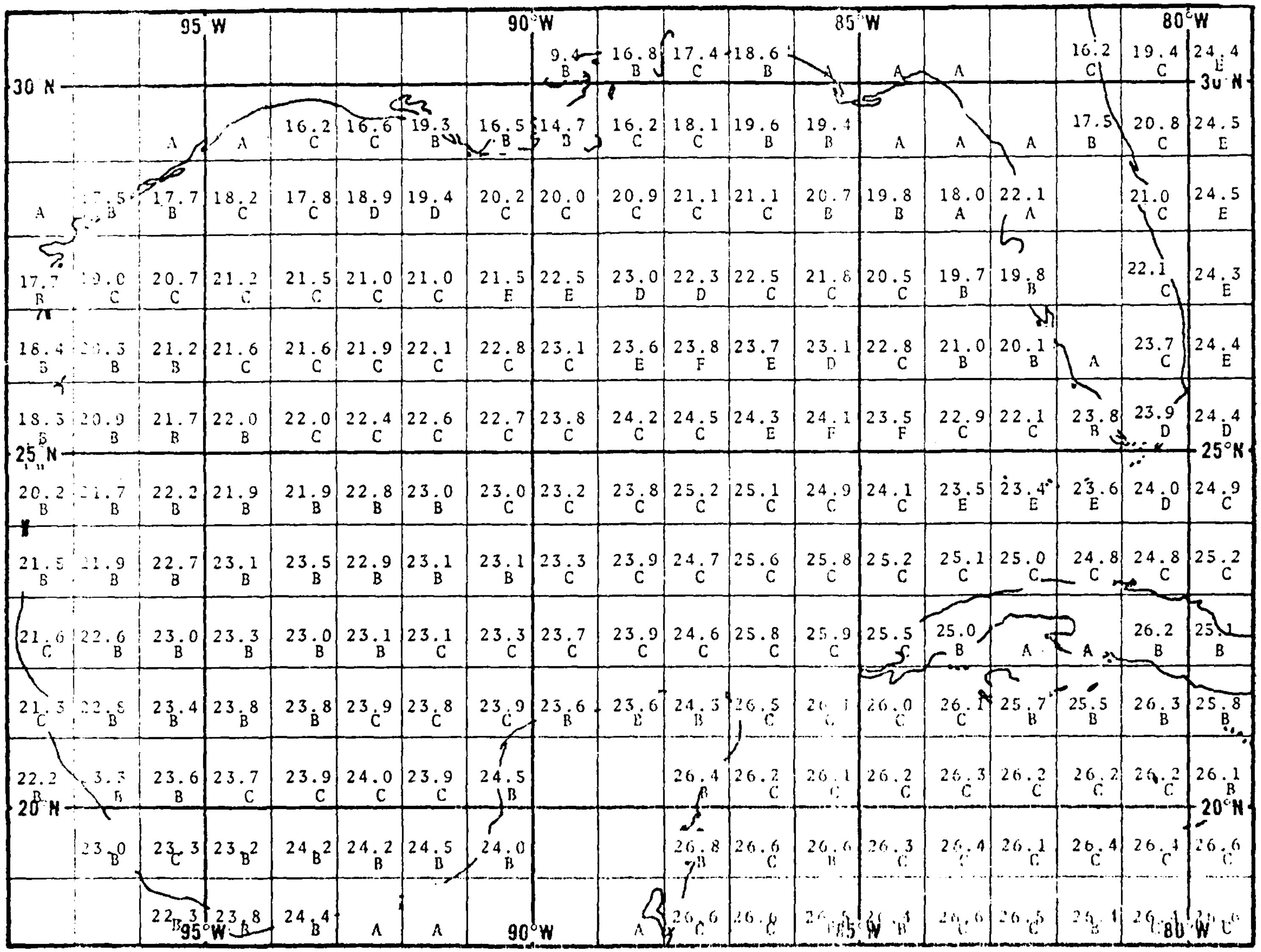


FIG 4-30

Average Sea Surface Temperatures (Numerical Value) and Observation Count (Letter) for February.

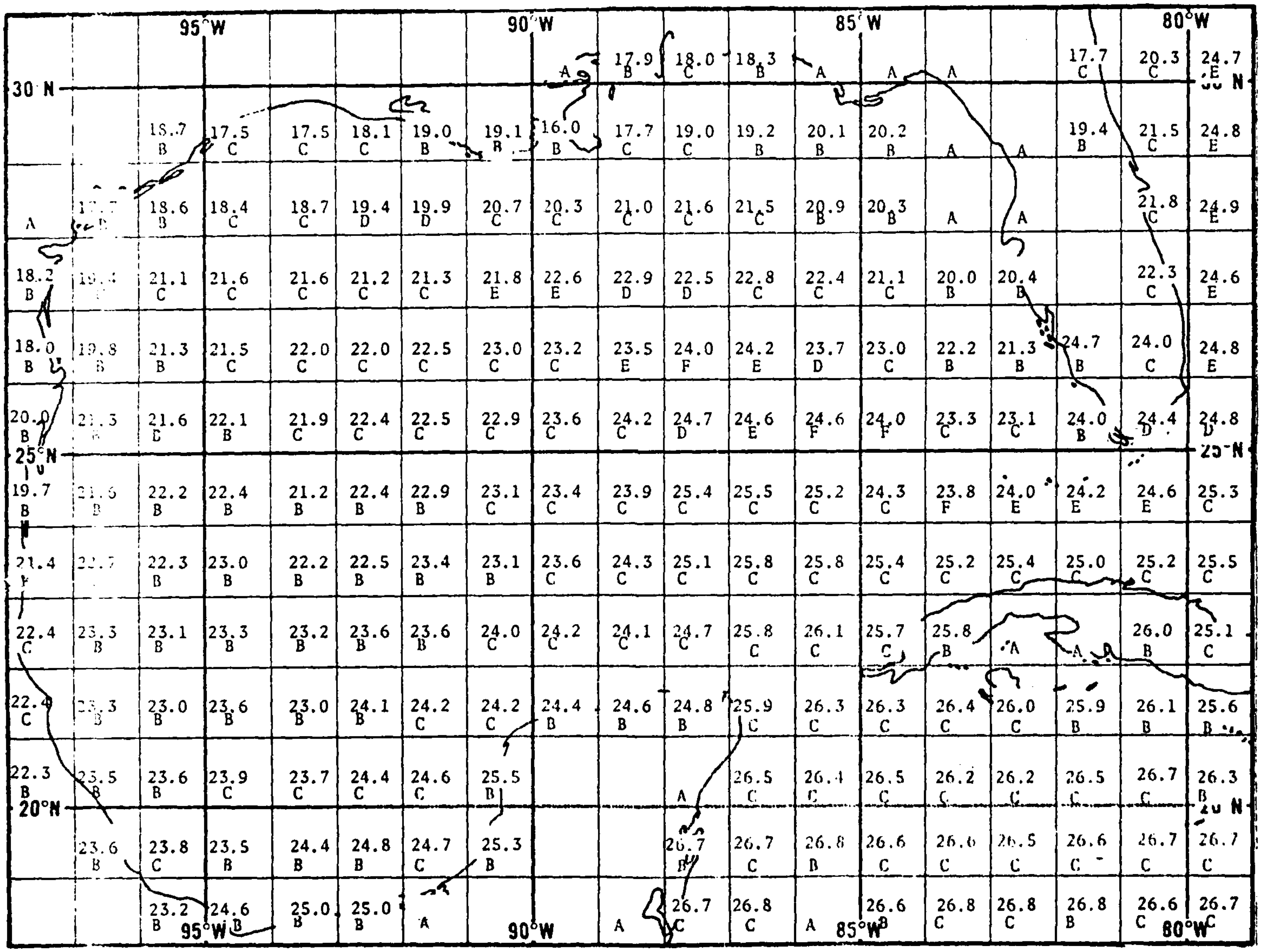


FIG 4-31

Average Sea Surface Temperatures (Numerical Value) and Observation Count (Letter) for March.

				95°W					90°W					85°W					80°W
30°N									A	20.7 B	20.7 C	22.6 B	A	A	A		21.2 C	22.5 D	25.4 E
			19.5 B	20.0 C	21.0 C	20.9 C	20.6 B	21.4 A	20.0 B	20.8 C	21.8 C	21.9 C	22.6 B	A	A	A	21.4 B	23.1 C	25.6 E
	A	[illegible]	21.0 B	21.0 C	21.1 C	21.4 D	21.7 D	22.2 C	22.1 C	22.6 C	23.1 C	23.0 C	23.3 B	22.2 B	A	A		22.6 C	25.6 E
	21.0 B	[illegible] C	22.4 C	22.6 C	22.9 C	22.8 C	22.7 C	23.0 E	23.4 E	23.8 D	23.8 D	24.0 C	23.7 C	22.8 B	22.2 B	22.3 B		23.4 C	25.4 E
	A	[illegible]	22.6 B	22.9 C	23.1 C	23.3 C	23.6 C	23.9 C	24.0 C	24.3 E	24.8 F	25.1 E	24.6 D	24.1 C	23.1 B	22.7 B	A	25.1 C	25.6 E
25°N	22.1 B	22.3 B	22.8 B	23.5 B	23.6 C	23.4 C	24.0 C	24.2 C	24.5 C	25.1 C	25.5 C	25.5 E	25.5 F	25.0 F	24.5 C	24.2 C	25.3 B	25.3 D	25.6 D
	23.0 B	23.7 B	23.0 B	23.3 B	24.5 B	24.3 B	23.8 B	24.2 C	24.7 C	25.3 C	26.1 C	26.1 C	25.9 C	25.4 C	24.8 E	25.0 E	25.2 E	25.4 E	25.5 C
	23.7 B	[illegible]	24.4 B	24.9 B	24.6 B	24.1 B	24.3 B	24.2 B	25.1 B	25.2 C	25.8 C	26.4 C	26.4 C	26.0 C	25.7 C	26.0 C	25.7 C	25.7 C	26.0 C
	24.0 C	24.7 [illegible]	24.3 B	24.5 B	24.3 B	24.3 B	24.9 B	24.8 C	24.9 C	24.8 C	25.5 C	26.6 C	26.6 C	26.2 C	26.0 B	A	A	25.9 B	25.6 C
	24.1 C	23.9 [illegible]	24.8 B	25.4 B	25.2 B	25.2 B	25.2 C	24.9 C	24.8 B	24.6 B	24.5 B	26.6 C	26.8 C	26.8 C	26.8 C	26.7 C	26.1 B	26.1 B	26.0 B
20°N	A	[illegible] B	25.1 B	25.2 B	25.1 C	25.3 C	25.8 C	26.6 B			A	27.2 C	27.0 C	27.0 C	27.0 C	27.2 C	27.1 C	27.1 C	26.7 C
		24.3 B	25.0 C	25.2 B	25.6 B	25.9 B	25.9 C	26.9 B			27.6 B	27.3 C	27.4 B	27.3 C	27.1 C	27.0 C	27.2 C	27.3 C	27.3 C
			A	25.6 B	26.1 B	26.3 B	A			A	27.2 C	27.4 C	27.5 B	27.5 C	27.3 C	27.3 C	27.2 B	27.3 B	27.3 C
				95°W					90°W					85°W					80°W

FIG 4-32

Average Sea Surface Temperatures (Numerical Value) and Observation Count (Letter) for April.

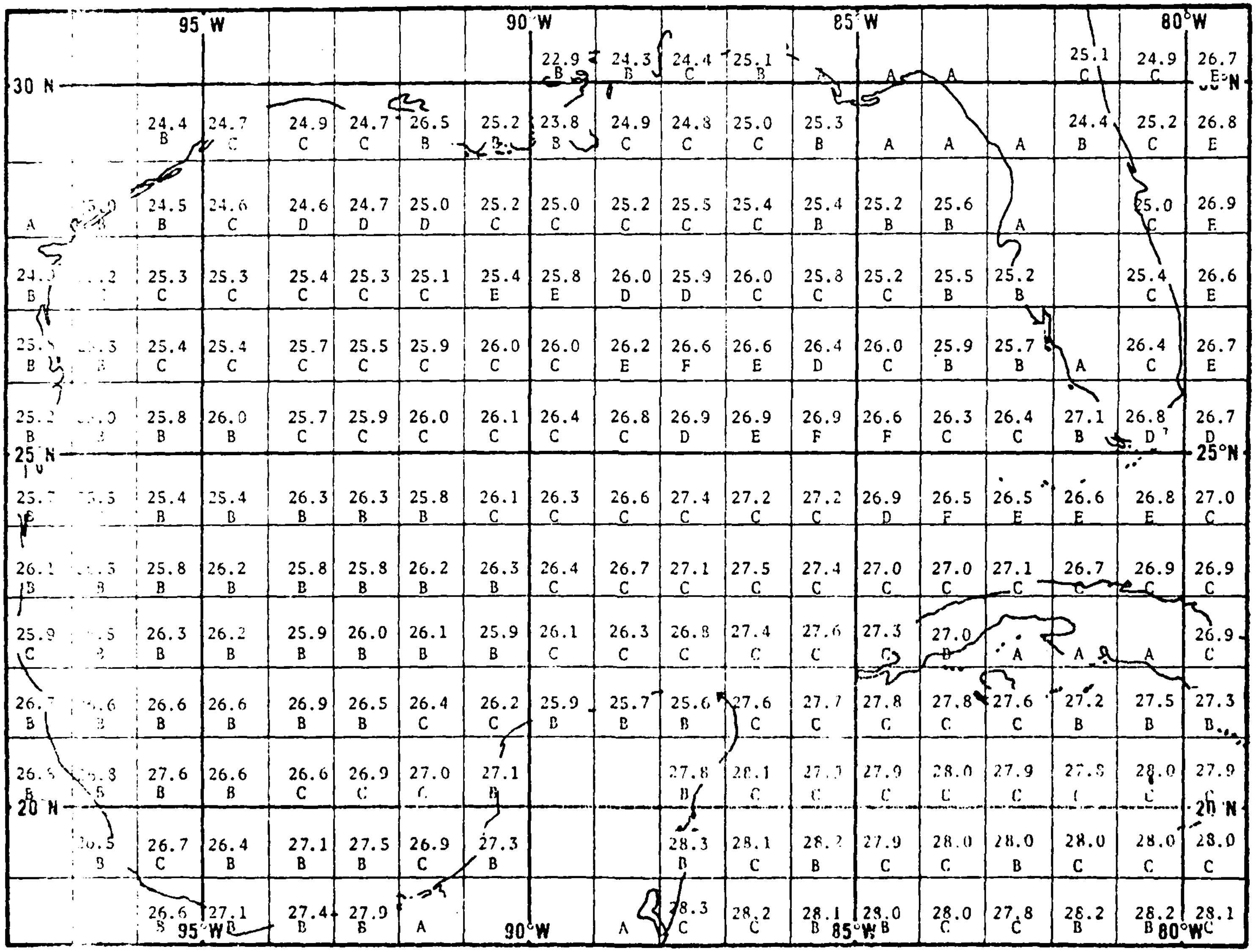


FIG 4-55

Average Sea Surface Temperatures (Numerical Value) and Observation Count (Letter) for May.

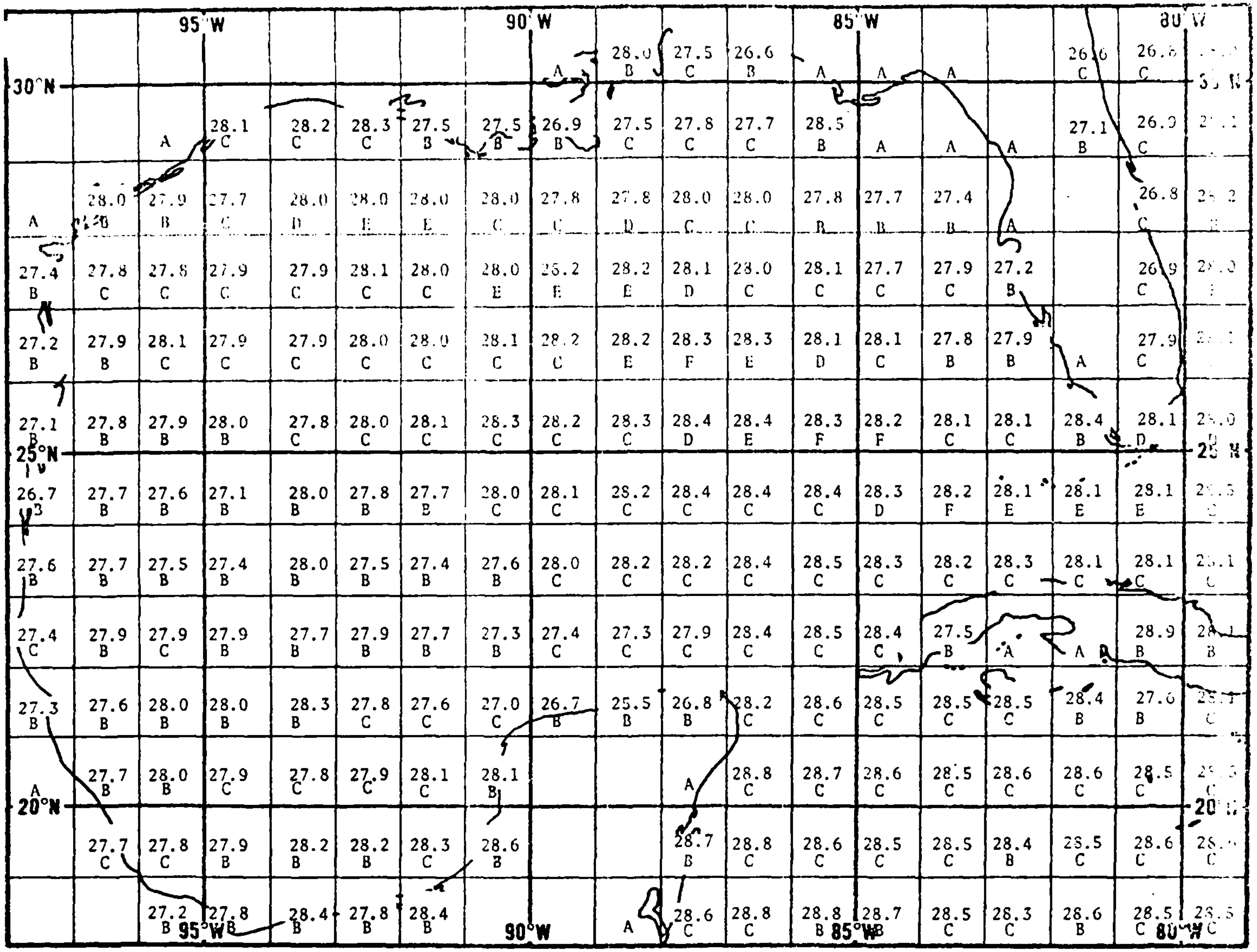


FIG 4-34

Average Sea Surface Temperatures (Numerical Value) and Observation Count (Letter) for June.

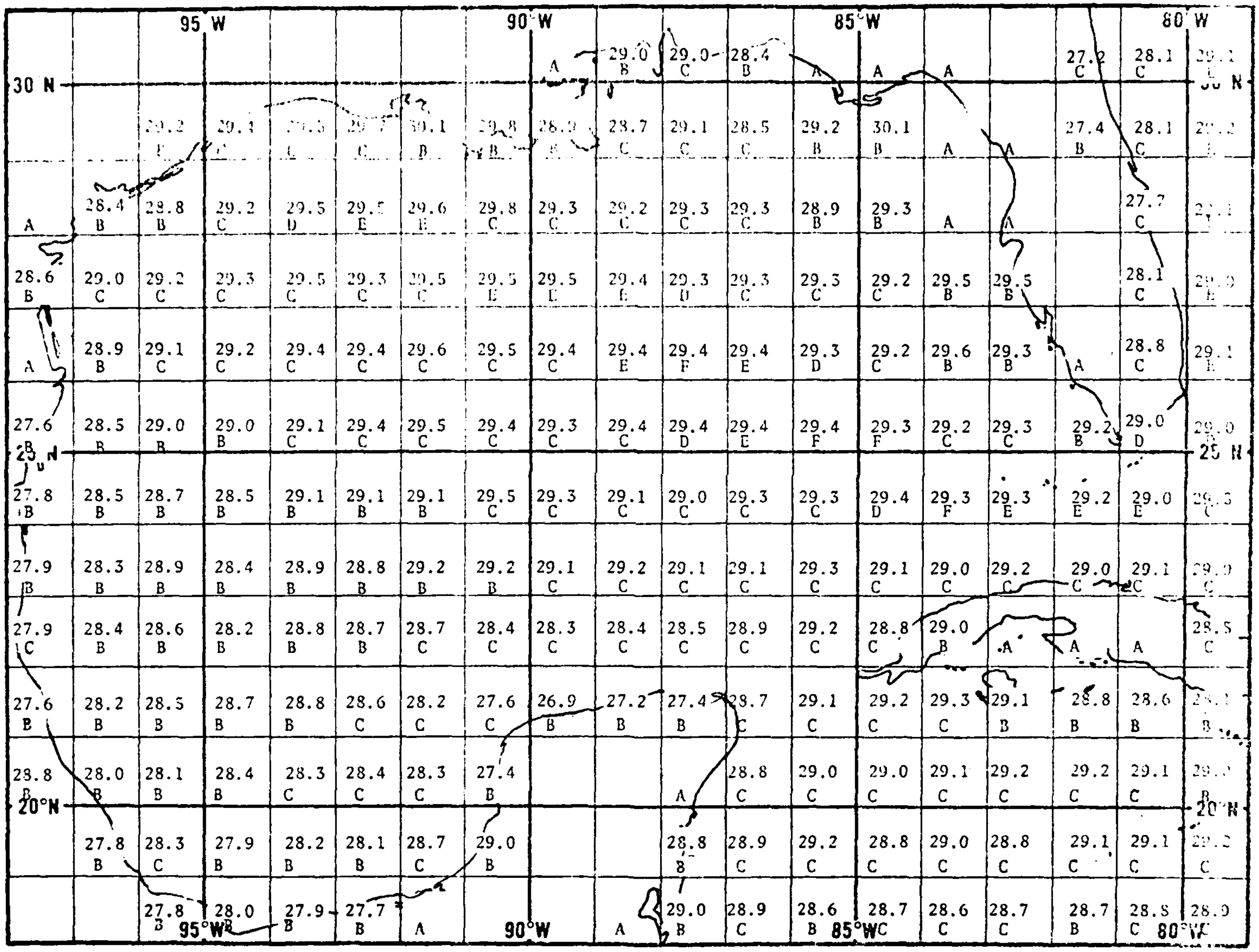


FIG 4-35

Average Sea Surface Temperatures (Numerical Value) and Observation Count (Letter) for July.

								A	29.4 B	29.6 C	29.5 B	A	A	A		27.0 C	28.4 C	[illegible]
		29.6 B	29.6 C	29.9 C	30.0 C	29.5 B	A	29.0 B	29.1 C	29.6 C	29.3 C	29.3 B	A	A	A	28.3 B	28.4 C	[illegible]
A	29.4 B	29.4 B	29.5 C	29.8 D	29.8 E	29.8 E	29.8 C	29.4 C	29.5 D	29.6 C	29.5 C	29.2 B	29.5 B	A	A		28.2 C	29.5 E
29.4 B	29.3 C	29.6 C	29.6 C	29.8 C	29.7 C	29.7 C	29.7 E	29.8 E	29.7 E	29.6 D	29.6 C	29.6 C	29.5 C	29.8 B	29.5 B		28.3 C	29.4 F
29.0 B	29.3 C	29.3 C	29.7 C	29.9 C	29.9 C	29.9 C	29.7 C	29.8 C	29.7 E	29.7 F	29.7 E	29.6 D	29.6 C	29.6 C	29.8 B	A	29.0 C	29.5 E
29.1 B	28.9 B	29.5 B	29.4 B	29.7 C	29.8 C	29.9 C	29.8 C	29.6 C	29.8 C	29.7 D	29.7 E	29.7 F	29.7 F	29.7 C	29.8 C	29.5 B	29.5 D	29.4 B
28.1 B	29.0 B	28.9 B	29.0 B	29.8 B	29.3 B	29.5 B	29.7 C	29.7 C	29.5 C	29.5 C	29.6 C	29.6 C	29.7 D	29.7 F	29.8 E	29.7 E	29.5 E	30.2 C
28.7 B	28.9 B	29.2 B	28.9 B	29.1 B	29.1 B	29.4 B	29.2 B	29.3 C	29.6 C	29.5 C	29.4 C	29.5 C	29.5 C	29.3 C	29.3 C	29.3 C	29.5 C	29.5 C
28.3 C	29.8 B	28.9 B	28.9 B	28.9 B	29.0 B	29.1 C	28.7 C	28.8 C	28.7 C	29.0 C	29.2 C	29.5 C	29.3 C	29.1 B	A	A	A	29.0 C
28.3 B	28.8 B	29.1 B	29.2 B	29.5 B	29.1 C	28.7 C	28.3 C	27.8 B	27.7 B	27.5 B	29.1 C	29.5 C	29.6 C	29.6 C	29.5 C	29.3 B	29.2 B	[illegible]
A	28.6 B	28.7 B	28.9 C	28.9 C	28.8 C	28.7 C	28.7 B			A	29.2 C	29.4 C	29.4 C	29.6 C	29.7 C	29.7 C	29.6 C	29.3 C
	28.6 B	28.7 C	28.3 B	28.6 B	28.4 B	28.4 C	29.1 B			29.3 B	29.4 C	29.5 B	29.3 C	29.3 C	29.3 C	29.5 C	29.6 C	29.6 C
		27.8 B	28.2 B	28.5 B	27.3 B	A			A	29.2 C	29.4 C	29.5 C	29.2 C	29.1 C	29.0 C	29.3 B	29.4 B	29.4 C

FIG 4-35

Average Sea Surface Temperatures (Numerical Value) and Observation Count (Letter) for August.

								A	28.3 B	28.8 C	28.6 B	28.2 B	A	A		28.0 C	28.0 C	29.0 E
		[illegible] B	[illegible]	28.[illegible] C	28.8 C	28.0 D	A	29.1 E	28.6 C	28.7 C	28.5 C	28.8 B	A	A	A	28.5 B	28.3 C	29.1 E
A	28.0 B	28.6 C	28.6 C	28.9 D	28.9 E	28.9 E	28.9 C	28.7 C	28.8 D	28.5 C	29.0 C	28.8 B	28.8 B	28.1 B	A		28.0 C	29.1 E
29.1 B	29.2 C	29.2 C	29.2 C	29.3 C	29.0 C	29.0 C	29.1 E	29.1 E	29.1 D	29.0 D	29.1 C	29.2 C	28.9 C	29.1 C	29.3 B		28.2 C	29.0 E
28.8 B	29.3 C	29.2 C	29.1 C	29.1 C	29.3 C	29.3 C	29.3 C	29.1 C	29.1 E	29.2 F	29.2 E	29.1 D	29.1 G	29.0 B	29.3 B	A	28.6 C	29.1 E
28.5 B	28.8 B	29.5 B	29.3 B	29.4 C	29.3 C	29.5 C	29.3 C	29.3 C	29.3 C	29.0 D	29.3 E	29.2 F	29.2 F	29.2 C	29.3 C	29.2 B	29.2 D	29.0 D
28.6 B	28.6 B	28.6 B	28.6 B	29.2 B	29.1 B	29.1 B	29.4 C	29.3 C	29.2 C	29.0 C	29.2 C	29.2 C	29.2 D	29.3 F	29.3 E	29.2 E	29.2 E	29.8 C
27.9 B	28.5 B	28.9 B	28.6 B	29.3 B	29.4 B	29.0 B	29.3 B	29.2 C	29.4 C	29.0 C	29.1 C	29.3 C	29.2 C	29.1 C	29.1 C	29.2 C	29.5 C	29.5 C
28.2 C	28.8 B	28.7 B	28.7 B	29.0 B	28.4 B	28.9 B	28.9 C	28.5 C	28.6 C	28.9 C	29.1 C	29.3 C	29.2 C	28.5 B	A	A	28.7 B	29.0 C
28.5 B	28.8 B	29.1 B	29.0 B	29.0 B	29.0 C	28.9 C	28.4 C	28.0 B	27.8 B	28.4 B	28.9 C	29.4 C	29.4 C	29.5 C	29.4 C	28.8 B	29.0 B	29.0 B
A	28.5 C	28.5 B	28.5 B	28.9 C	28.9 C	28.6 C	29.1 B			A	29.2 C	29.5 C	29.4 C	29.4 C	29.5 C	29.6 C	29.6 C	29.6 B
	28.3 B	28.4 C	28.3 B	28.8 B	28.8 B	29.2 C	29.2 B			29.1 B	29.4 C	29.3 B	29.3 C	29.4 C	29.4 B	29.4 C	29.4 C	29.6 C
		28.0 B	28.0 B	29.0 B	29.0 B	29.2 B				29.3 B	29.5 C	29.2 B	29.2 B	29.4 C	29.2 C	29.2 B	29.4 C	29.3 C

FIG 4-37

Average Sea Surface Temperatures (Numerical Value) and Observation Count (Letter) for September.

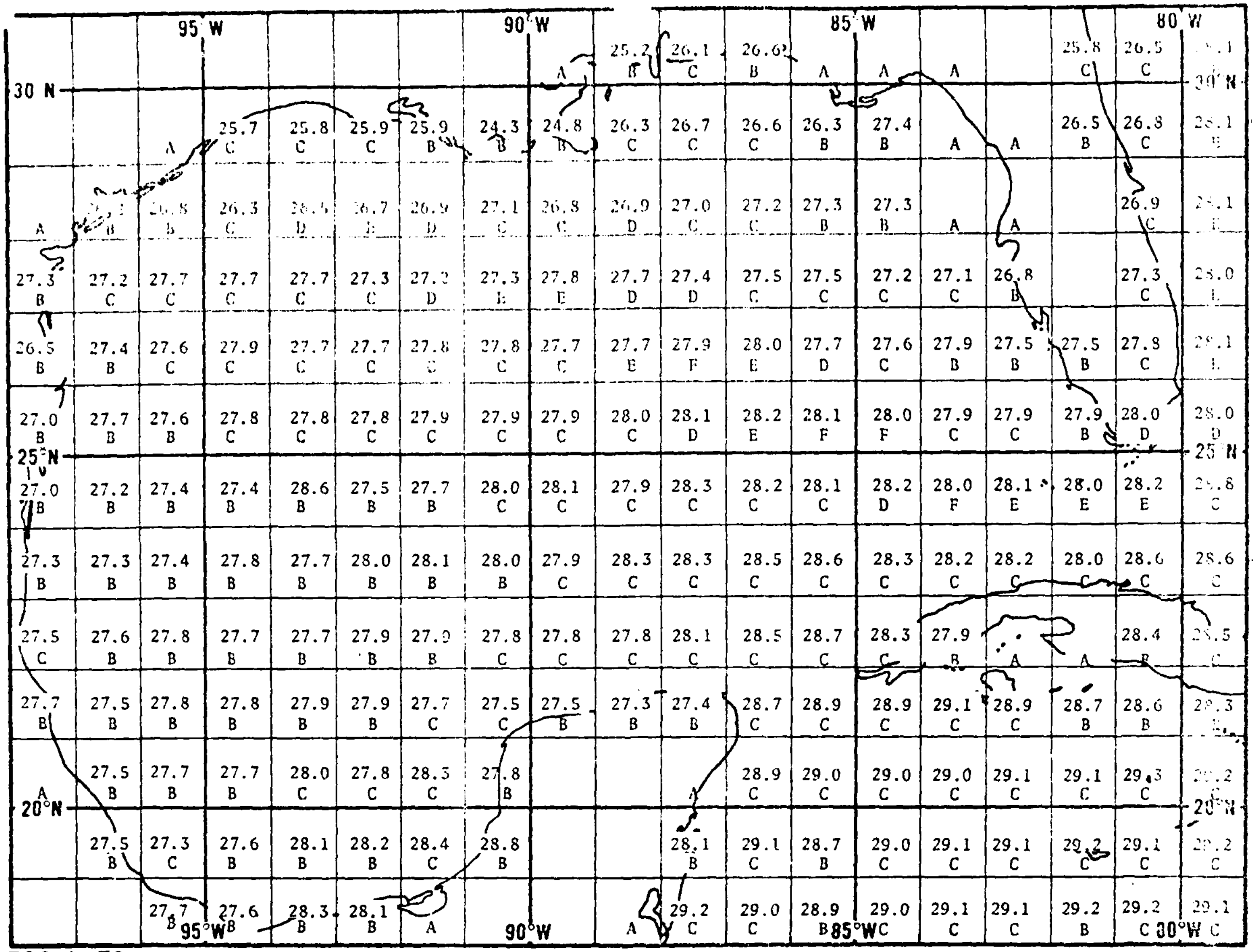


FIG 4-38

Average Sea Surface Temperatures (Numerical Value) and Observation Count (Letter) for October.

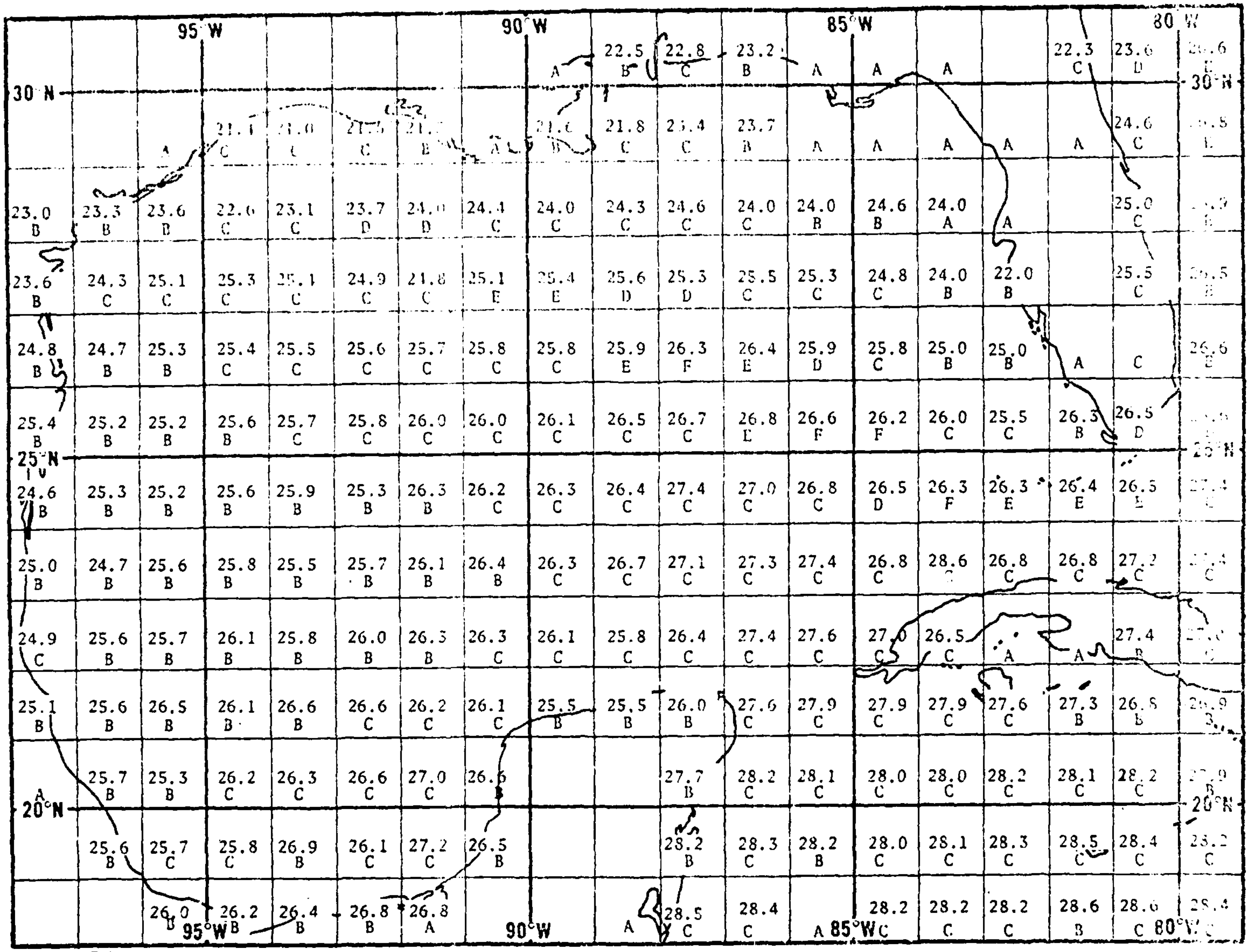


FIG 4-39

Average Sea Surface Temperatures (Numerical Value) and Observation Count (Letter) for November.

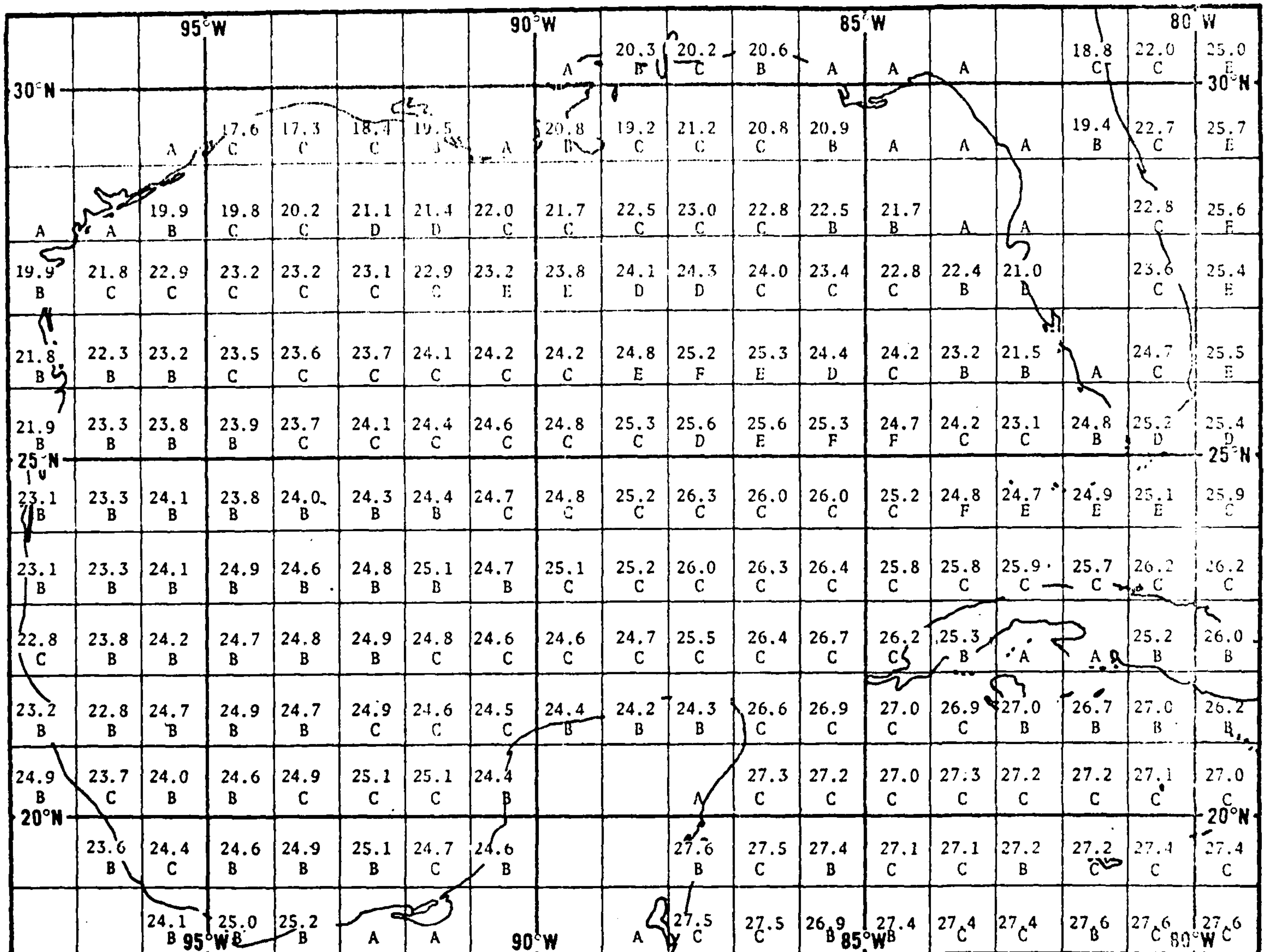


FIG 4-40

Average Sea Surface Temperatures (Numer[illegible] Value) and Observation Count (Letter) for December.

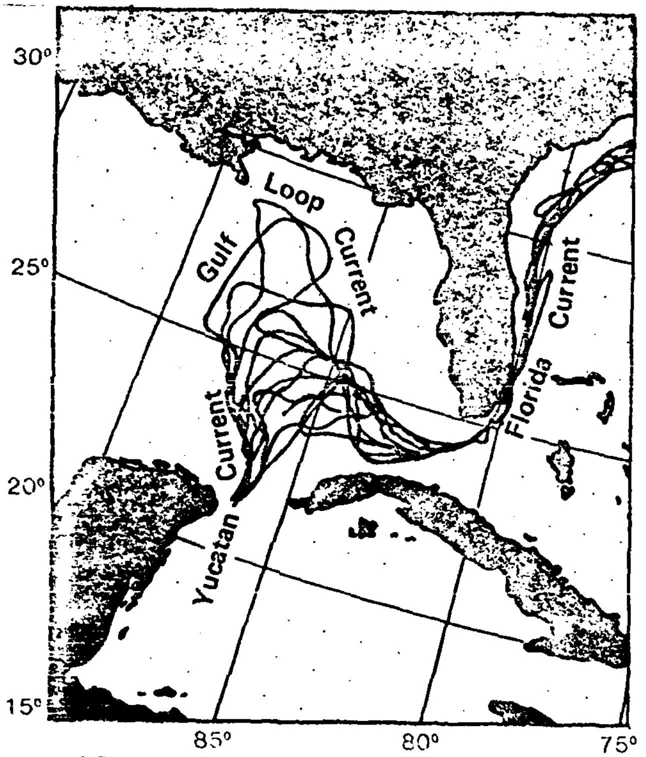


FIG 4-41

Gulf Loop Current Positions During a Typical Annual Cycle. The Loop Current Intrudes Furthest North Into the Gulf During the Spring of the Year.

Chapter 5

Off-Base Weather Support, 20th NORAD Region Sector II

5-1 General: Det 9, 12 WS supports the Tyndall NORAD Control Center (TNCC) and 20th NORAD Region Sector II. As the Region Weather Station (RWS) for Sector II we are responsible for monitoring all NORAD resources within the sector to include radar sites, alert bases and aircraft.

5-2 Geography: Sector II encompasses the eastern half of the southern United States to include: The Gulf of Mexico, the eastern half of Texas, entire Louisiana, the southern two thirds of Mississippi, Alabama and Georgia, extreme southern portion of South Carolina and the major portion of Florida. (See Figure 5-1 for boundaries).

a. Topography: Sector II comprises all of the Gulf Coastal Plains area and the Gulf of Mexico, the land is for the most part gently rolling terrain with numerous rivers throughout. In the southern portion along the Gulf, marshlands and swamps are frequent as are bays. Two mountain ranges affect the sectors weather, in the western portion (Central Texas) lie the foothills of the Rocky Mountains and the Appalachian Mountains extend into northern Georgia. Both of these mountain ranges act as climatic barriers and provide an upslope trajectory under certain wind flow.

5-3 Sector II Support Requirements:

a. Det 9 has the final responsibility for issuing Point Warnings for the following radar sites within Sector II:

SITE	NUMBER	AFGWC ADVISORY NUMBER
Tyndall AFB, FL	Z-198	FL-2
Richmond AFS, FL	Z-210	FL-20
Ft. Lonesome, FL	Z-330	FL-16
Cross City, FL	Z-333	FL-17
Slidell, LA	Z-246	LA-6
Lake Charles, LA	Z-248	LA-5
Oilton, TX	Z-242	TX-30

We are responsible for issuing Point Warnings for the following criteria:

Warning Criteria for Radar Sites

50Kt Surface Winds	30 min
Tornadoes	ASAP
Freezing Precipitation	30 min
Tropical Storm/Hurricane max sustained wind 50Kts and tide information	12/24 hours

In addition to those sites we are responsible for the following sites which have warnings issued by the Naval Weather Service at Key West, FL. These warnings will be issued for the same criteria listed above.

SITE	NUMBER	AFGWC ADVISORY NUMBER
Key West NAS FL	Z-209	FL-12
Cudjoe Key FL	Z-399	FL-7

b. AFGWC has the responsibility for issuing Point Warnings for Ellington AFB, Texas site Z-240, the AFGWC PW for TX-28 will be the official warning for Ellington for the following criteria:

CRITERIA	DESIRED LEAD TIME
Thunderstorms and surface wind $\geq$ 35Kts	30 min
Thunderstorms and surface wind $\geq$ 50Kts	30 min
Hail $\geq \frac{1}{2}$ inch	30 min
Two inches or more rain in 12 hours	N/A
Tornadoes	ASAP
Freezing Precipitation	30 min

In addition to the AFGWC warning Det 9 has the responsibility for 50 Kt winds associated with hurricane/tropical storms to affect Ellington AFB within 12/24 hours.

c. Det 9 will provide terminal met watch for the following alert bases and criteria:

Sector II Alert Bases

BASE	UNIT	TYPE AIRCRAFT
Ellington AFB, TX	111th FIS	F-101
New Orleans (Navy) LA	Det 1, 147th FIG	F-101
Tyndall AFB, FL	Det 1, 87th FIS	F-106
Homestead AFB, FL	31st TFW	F-4

The three weather categories for these bases that are used are:

$$V = \geq 1000/3$$

$$I = < 1000/3 \geq 300/1$$

$$X = < 300/1$$

If these bases go below 1000/3, the TNCC Senior Director will be notified.

TNCC must be notified when the alert bases are forecast to be below the following minimums:

1. Tyndall and Homestead: 300/1.
2. Ellington and New Orleans: 500/1½

If conditions are forecast to be below these categories, the Senior Director will be notified at least two hours prior to the forecast onset.

5-4 Major Controlling Features:

a. Summer: Sector II's weather pattern is dominated by the Bermuda Ridge from late spring through early fall. The associated trade winds prevail over any other synoptic situation, flow aloft is from the east to southeast and light. The proximity to abundant moisture sources, the Atlantic and Gulf, combined with easterly flow produces a maritime tropical air mass over the sector which dominates throughout the summer. Frontal activity is virtually non-existent during this period and air mass thunderstorm activity becomes a daily occurrence.

b. Synoptic Weather - Summer:

(1) Fronts: Frontal activity decreases rapidly by mid-spring as the Polar jet retreats to the north. The isolated cold front that moves into the sector during summer will be slow moving and normally become stationary within the northern third of the sector. Frontal penetration into the sector during summer will enhance the daily air mass thunderstorm activity and the northwesterly winds aloft will steer these storms southward where they will stall along the coast. Weather along the front will produce visibility restrictions in the form of rainshowers and thunderstorms and ceilings of 1,500-2,500 feet. These conditions will be encountered 4-6 hours prior to frontal passage and with passage conditions will improve rapidly to scattered cumulus in to 2,500-3,500 foot range.

(2) Visibility Restrictions: Summer is the period of the best visibility throughout the sector. Fog is an isolated occurrence and will dissipate rapidly due to heating. Thunderstorm and rainshowers are the most common restrictions and will frequently reduce visibility to 3 miles or less, ½ mile is not uncommon as a storm moves over a station. Being associated with air mass activity, these periods of poor visibility will seldom last more than 30 minutes to 1 hour and will improve rapidly as the storm moves or dissipates.

(3) Hazardous Weather:

(a) Thunderstorms: Thunderstorm activity is a daily occurrence with peak activity occurring during July and August. Virtually all thunderstorm activity is air mass and occurs with moist southerly flow and heating, conditions which prevail over the entire sector at this time. Severe thunderstorm activity is infrequent but can occur when an upper level trough strengthens air mass development. Convective gusts can exceed 40Kts during summer but the most common gust associated with the thunderstorms will be in the range of 20-30Kts. Air mass thunderstorms act in a unique manner along the coastal area where the majority of Sector II alert bases and radar sites are located. Normal development will occur 10-15 miles inland as a result of the sea-breeze effect and not routinely affect the coastal locations directly; however, due to their proximity they will affect local flying areas. With the rare occurrence of a cold front penetrating the sector, afternoon activity will increase and move south to stall along the coast. Nocturnal thunderstorms will develop over the Gulf and with easterly flow aloft drift along the coast. At sunrise these storms will move onshore and affect coastal location. They will dissipate rapidly upon landfall, rarely lasting more than 1 hour. Increased nocturnal activity over the Gulf does not indicate increased activity over the land during the day.

(b) Gusty Winds: Gust associated with thunderstorms will seldom exceed 30Kts during summer but can reach 45Kts with intense cells. The most significant producer of strong gusty winds during summer is the tropical storm. Hurricane winds in excess of 100Kts are common and along the coastal areas cover a radius of 75-100 miles.

(c) Hail: An uncommon occurrence anywhere in the sector, it is extremely rare along the coastal area. Occurrences in the more northern portions are associated with severe thunderstorm activity and short in duration.

(d) Hurricanes and Tropical Storms: This is the major threat to NORAD resources within Sector II. Due to the proximity to alert bases and radar sites to the coast, storm surge and winds can result in severe damage. Hurricanes

and tropical storms can occur throughout the summer but most often in August and September, development can occur rapidly and 5-7 tropical storms will threaten the sector each year. Development and movement must be monitored closely as several locations supported may be affected by the same storm.

(e) Other Significant Weather: Easterly waves will develop in the light easterly circulation and affect the sector 1-2 times a month during this period. Wave formation is often difficult to detect due to the sparsity of data in the southeastern portion of the sector, increased TRW/RW activity over the Gulf and Cuba during the day or increased nocturnal activity over Florida may indicate wave development. Easterly waves will show up as inverted troughs in the easterly flow and are the producers of the longest lasting periods of poor weather, other than hurricanes, that will affect the sector during summer. As they move along the southern portions of the sector (4-6^{o} Longitude per day) extensive cloudiness will move into the area and ceilings of 1,000-2,000 feet will last for 18-36 hours, rainshowers and thunderstorms will be common.

c. Winter Controlling Features: The major feature controlling Sector II's weather during winter is the southerly migration of the Polar jet. Frontal activity penetrates the northern portion of the sector with increased frequency in October and continues to move south with the Polar jet. Throughout the winter, modified continental polar will alternate with maritime tropical as the prevailing air mass over the sector, an occasional maritime polar intrusion will move into the western portions of the region but modifies rapidly with little difference between it and continental polar. By mid winter the Polar jet is strongly establsihed over the southern portion of the United States and the frequency of frontal passage increases to one every three days. Occasional outbreaks of Artic air will bring the sector its coldest temperatures with freezing occurring into the southern portions of Florida. Westerly flow aloft will dominate over the entire sector and speeds will show significant increase from the light easterlies of summer. Thunderstorm activity will decrease as the air mass thunderstorm rapidly diminishes in frequency and thunderstorms become associated with frontal activity. Fog and stratus are significant forecast problems and affect flying operations over the entire region. Overrunning of stationary fronts will produce extensive areas of low ceilings (500-1,000 ft) and poor visibility.

d. Synoptic Weather - Winter

(1) Fronts: As the polar jet moves southward to become strongly established over the southern portion of the US and adjacent coastal waters, frontal activity will increase over the entire sector. Cold fronts will penetrate further south, with the progression of the jet, but will frequently become stationary over the northern portions of the Gulf of Mexico. Changes in the long wave pattern will result in large scale meridonal ridges and troughs. The axis of the long wave trough is a key indicator of frontal movement. With the axis of the long wave trough over the eastern portions of the sector, fronts will move quickly through the area and with a deep amplitude trough will bring the sector its coldest temperatures. Fronts of this type will have a narrow band of clouds and RW/TRW and clear rapidly with frontal passage. The longest lasting and most extensive areas of poor weather are associated with shallow amplitude troughs or when the long wave axis is located over the western portions of the sector. In either of these cases fronts will tend to become stationary over the southern portions of the region. Southerly flow will produce overrunning and low stratus/stratocumulus ceilings will progressively expand eastward through the sector. Precipitation will increase north of

the front with drizzle and rain. These conditions can persist for several days and clearing will occur with a major short wave moving through the sector. A similar situation occurs with development of a Gulf wave along the polar front. Development of this wave should be monitored whenever a short wave approaches the stationary polar front over the gulf. As the wave develops, increased overrunning of the warm front will be noticed and low ceilings and precipitation will increase. The wave will move along the front to the northeast. As it moves to the north of a location clearing will occur followed by RW/TRW activity associated with the approaching cold front.

(2) Visibility Restrictions: Visibility is reduced more often throughout the region than at any other time. The abundant moisture available results in fog becoming a common occurrence. Radiational fog is frequent and the resulting visibility will vary greatly throughout Sector II, depending on location and additional moisture sources (swamps, rivers). Inland stations experience radiational fogs more often as temperatures at coastal locations are moderated by the warmer gulf waters. In the western portions of Sector II the upslope conditions in central Texas will result in fog formation when there is a southeasterly onshore flow. Sea fog is a persistent problem during mid winter for coastal locations as warm moist air moves over the relatively cooler inshore waters. Sea fog normally occurs during midafternoon and can reduce visibility to zero in minutes. Poor visibility associated with wave development and frontal overrunning is the most persistent fog and will affect large portions of the sector. High pressure systems that become stationary off the east coast can result in advection of Atlantic stratus and fog into the eastern portions of the sector. This fog will advect further westward each day the high persists, but it is uncommon for it to progress further than central Alabama-western Florida.

(3) Hazardous Weather:

(a) Thunderstorms: Thunderstorm activity is at a minimum during this period and severe thunderstorms are rare until spring. Frontal activity during this time most frequently is the result of wave development followed by cold frontal passage.

(b) Gusty Winds: Surface winds show a general increase with gusts of up to 20Kts becoming common. Gusts of 35Kts can occur with a strong frontal system and its associated tight gradient; however, gusts in excess of 35Kts remain an isolated occurrence.

(c) Hail: Hail remains an uncommon occurrence, the isolated reports of hail are most common in the north central portions of the sector and is extremely rare along the coast. Hail occurrence is predominately associated with strong squall line thunderstorms.

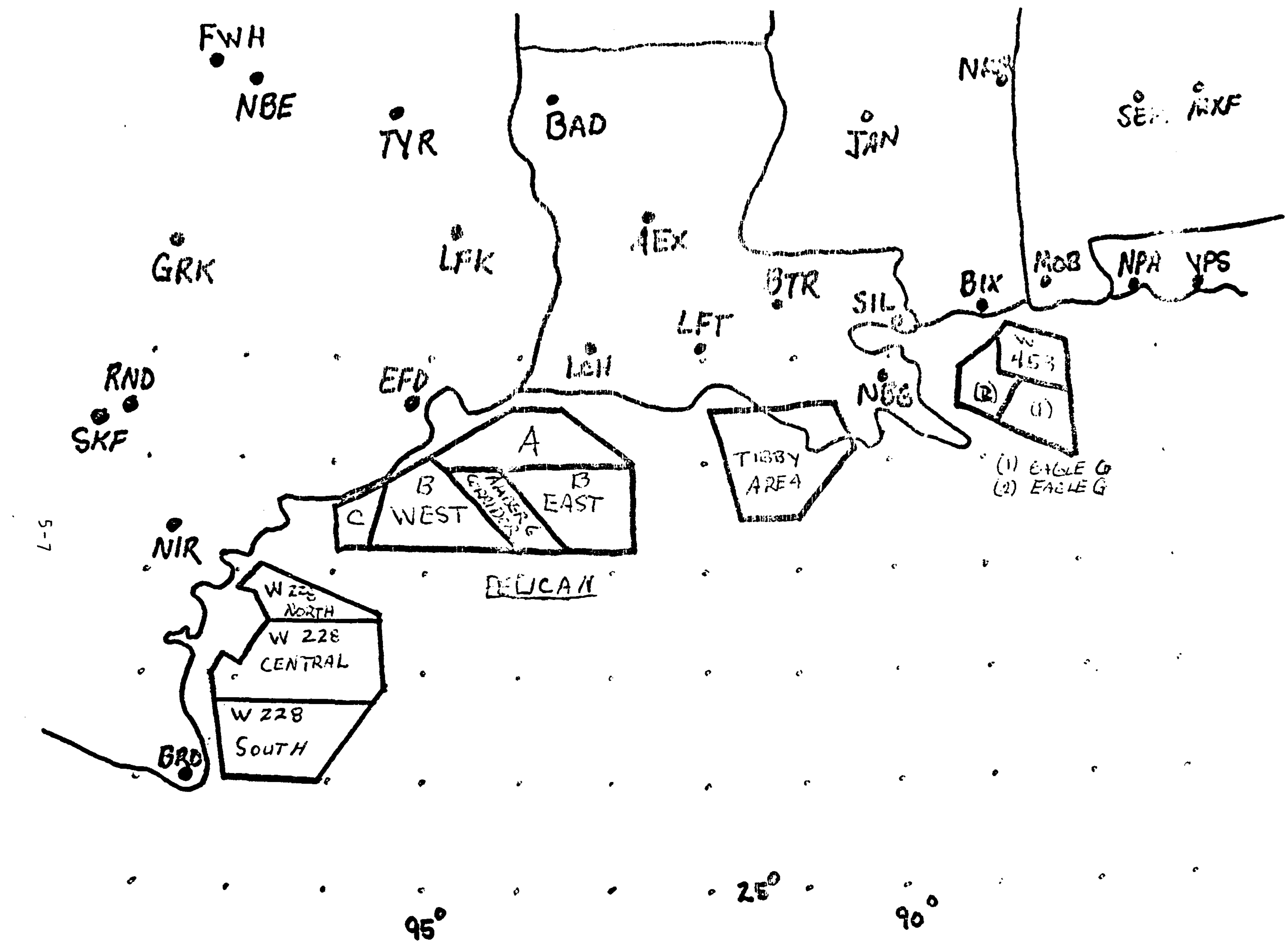
(d) Turbulence: Associated with the stronger winds of winter turbulence in the lower levels (surface to 10,000 ft) is often encountered, most frequently in the light intensity. Terrain in the western and northeastern portions of the sector should be taken into consideration when forecasting turbulence. Low level wind shear is frequent with fast moving fronts.

(e) Icing: The stratified cloud conditions of winter and the lowering of the freezing level require a careful evaluation of icing conditions. The most frequent occurrence is light to moderate rime but wave development and overrunning can produce mixed icing conditions.

e. Transition Periods: The transitional periods of spring and fall are ill-defined as summer and winter are the predominant seasons.

(1) The fall season produces the first frontal passage and a brief period of cool weather in contrast to the warm temperatures of summer. Frontal passages increase slowly and do not become frequent occurrences until winter. Fronts during fall do not produce extensive areas of weather and clearing occurs rapidly with the cool dry air behind the front. Quasi-stationary fronts during fall will often wave back and forth across a location producing RW/TRW activity with each frontal passage. Severe weather is an infrequent occurrence but does occur through the central portions of the region associated with squall lines in advance of slow moving cold fronts. Fog is normally produced by radiational cooling and is in the form of patchy ground fog. Fall gives the best flying conditions of the year and is the most comfortable season with warm days and cool nights.

(2) The onset of spring is marked by a lesser penetration of fronts to the south and in the upper air by a gradual weakening of the westerlies. Stationary frontal systems lying E-W will become more frequent and gradually become stationary further north. Frontal overrunning of these stationary fronts by moist gulf air will still be a frequent occurrence but will affect Sector II less often as the frontal zone is located progressively further north. Low ceilings and precipitation will still occur to the north of the front and there will be a marked increase in thunderstorm activity. Gulf wave formation will decrease through spring. Increased low level jet activity through Texas will produce deeper penetrations of Gulf moisture and the frequency of severe thunderstorm activity increases to its highest of the year. Frontal squall line occurrences will increase over the southern plains and eastward. Severe weather along the coastal areas still remains rare with the majority of severe weather occurring in the central and northern portions of the sector. Frequency of fog formation shows a marked decrease and air mass thunderstorm activity will increase with the return of the unstable warm moist air of summer.



FWH
NBE
TYR
BAD
JAN
SEM
NKF
GRK
LFK
AEX
BTR
SIL
BIX
MOB
NPA
VPS
LFT
LCH
RND
SKF
EFD
NBG
A
B WEST
B EAST
AMBER 6 CORRIDOR
C
TIBBY AREA
W 453
(1)
(2)
(1) EAGLE G
(2) EAGLE G
PELICAN
NIR
W 228 NORTH
W 228 CENTRAL
W 228 SOUTH
BRO
25°
95°
90°

FIG 5-1

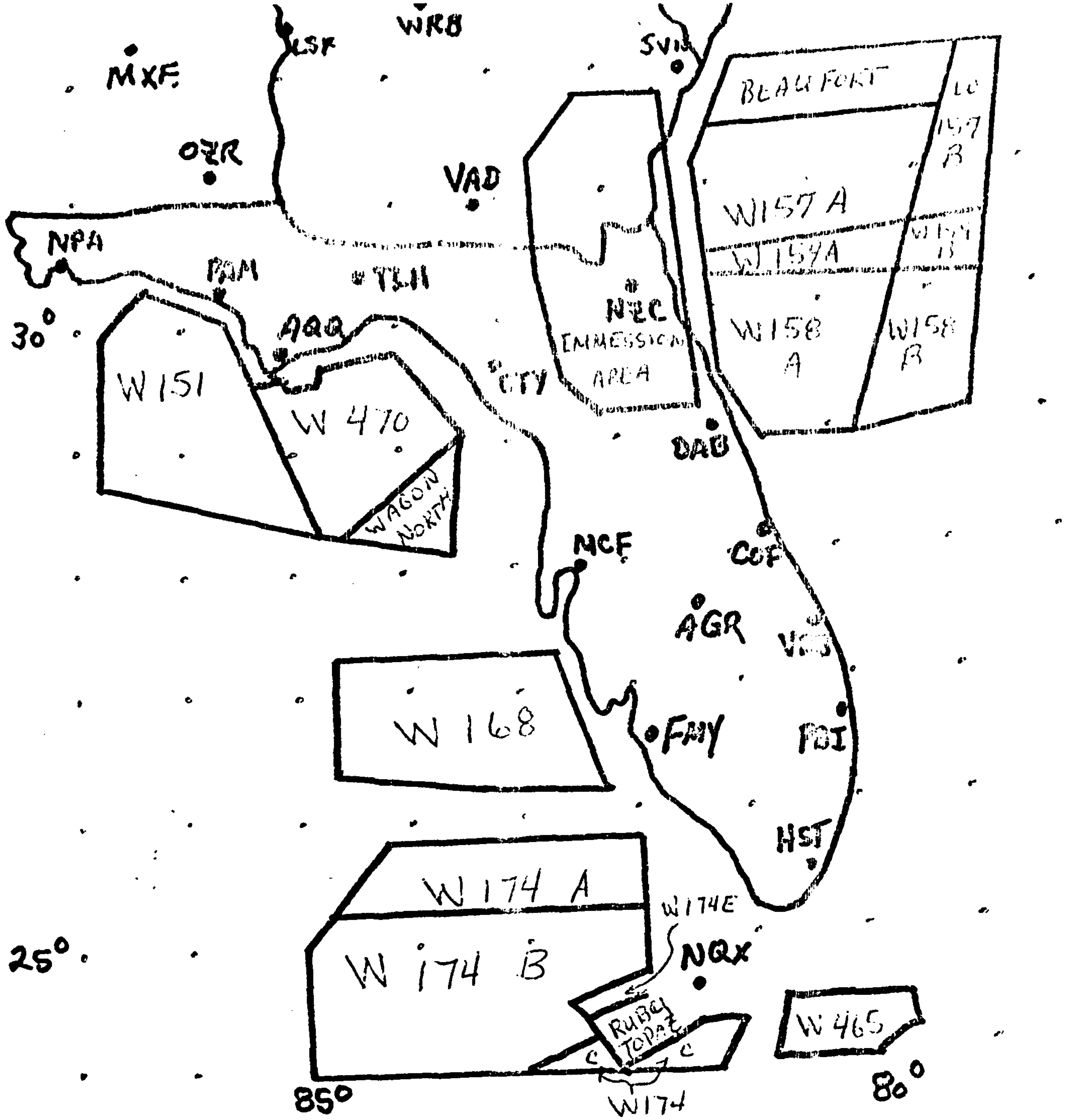

WRB
LSF
MXF
OZR
VAD
SVN
BEAUFORT
W157 A
W157 B
W159A
W158 A
W158 B
NPA
PAM
TLH
NEC
EMMESSION AREA
30°
AQQ
W151
W 470
CTY
WAGON NORTH
DAB
MCF
COF
AGR
W 168
FMY
PBI
HST
W174 A
W 174 B
W174E
NQX
25°
RUBY TOPAZ
W 465
85°
80°
W174

FIG 5-2

20th NORAD, Sector II Radar Sites

LOCATION

Site Number	Name		Figure
Z-198	Tyndall AFB, FL	30°04'33"N 85°33'32"W	5-3
Z-210	Richmond AFS, FL	25°37'24"N 80°24'18"W	5-4
Z-330	Fort Lonesome, FL	27°38'N 82°07'W	5-5
Z-333	Cross City, FL	29°44'N 83°0'W	5-6
Z-246	Slidell, LA	30°20'50"N 89°46'50"W	5-7
Z-248	Lake Charles, LA	30°11'03"N 93°10'27"W	5-8
Z-240	Ellington AFB, TX	29°36'54"N 95°10'24"W	5-8
Z-242	Oilton, TX	27°29'55"N 98°58'05"W	5-9

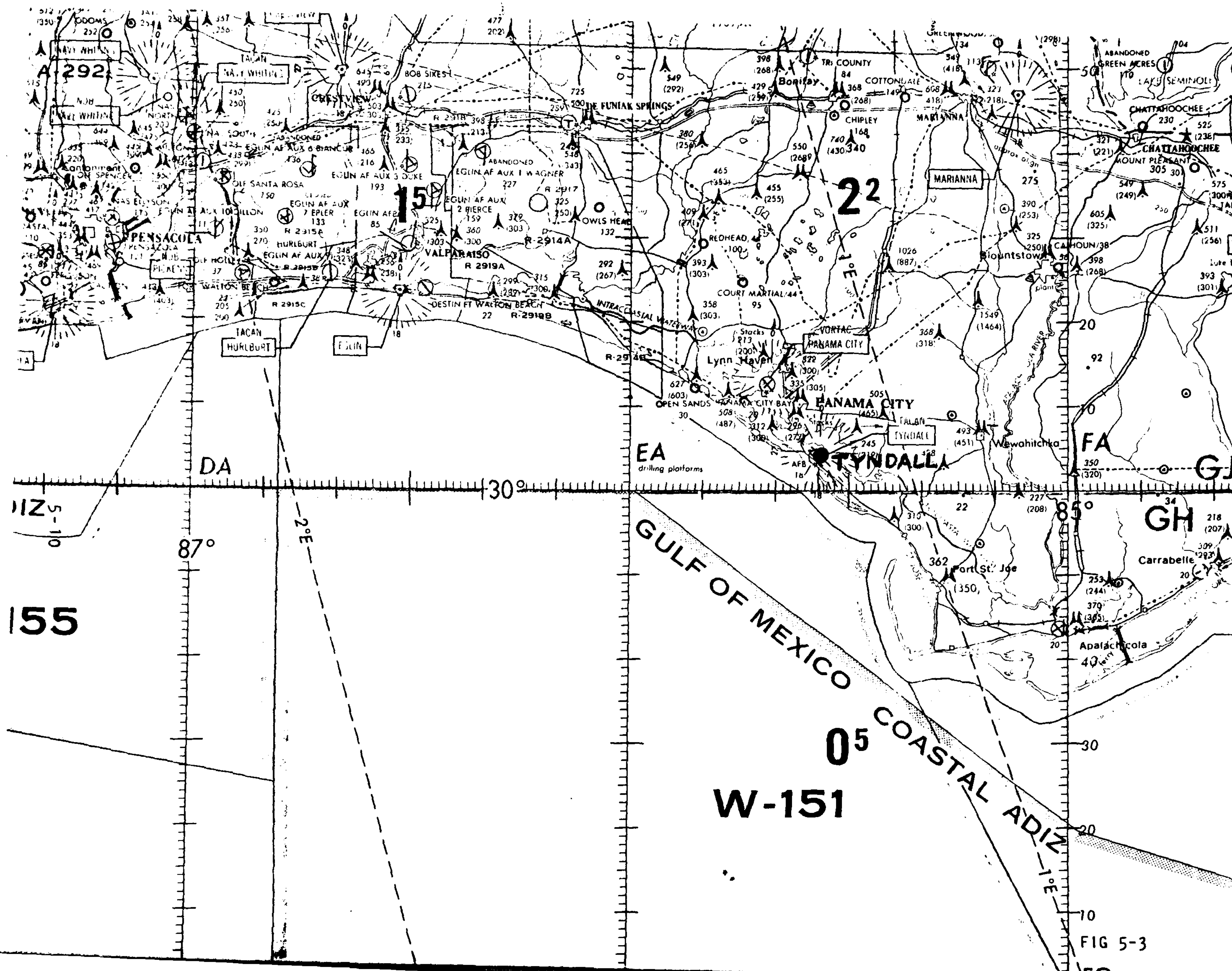

PENSACOLA
CRESTVIEW
BOB SIKES
DE FUNIAK SPRINGS
VALPARAISO
DESTIN FT WALTON BEACH
HURLBURT
EGLIN
OWLS HEAD
REDHEAD
COURT MARTIAL
Lynn Haven
PANAMA CITY
TYNDALL
MARIANNA
CHIPLEY
Bonifay
TRI COUNTY
COTTONDALE
Blountstown
CALHOUN
Wewahitchka
Port St. Joe
Apalachicola
Carrabelle
CHATTAHOOCHEE
MOUNT PLEASANT
ABANDONED
GREEN ACRES
LAKE SEMINOLE
OPEN SANDS
INTRACOASTAL WATERWAY
drilling platforms
GULF OF MEXICO
COASTAL ADIZ
W-151
155
DA
EA
FA
GH
30°
87°
85°
2°E
1°E
R 2919A
R 2914A
R 2919B
R 2915C

FIG 5-3

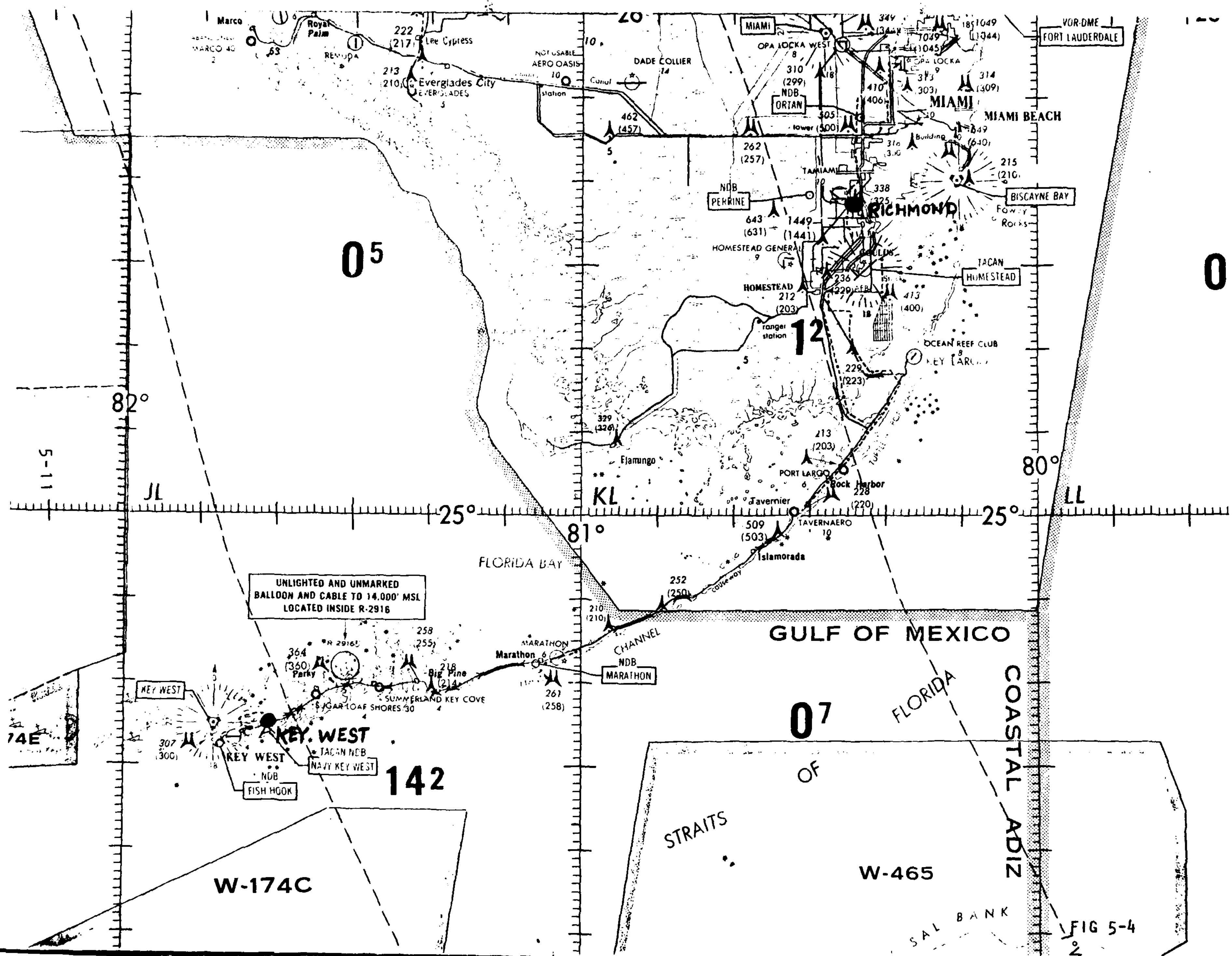
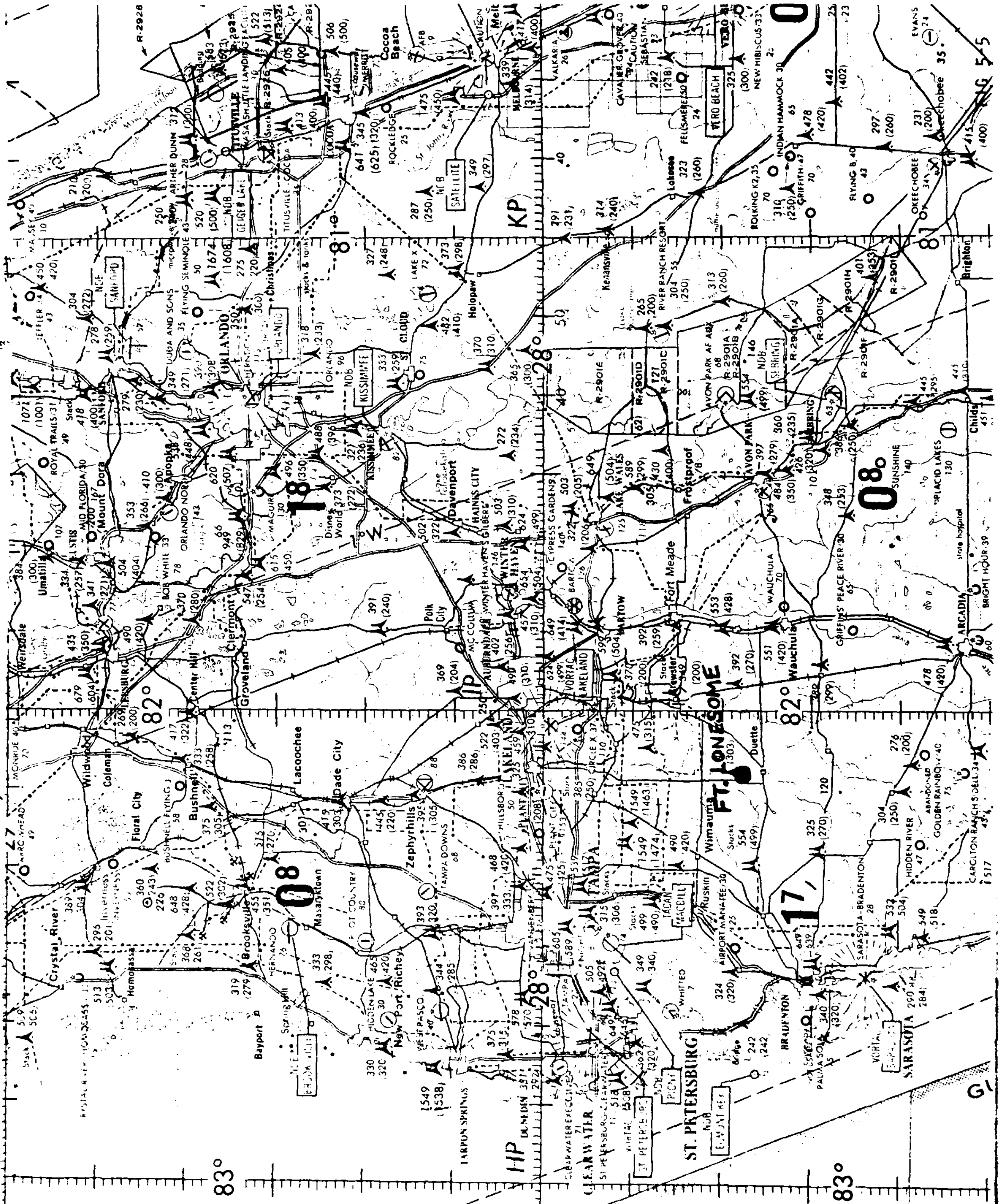
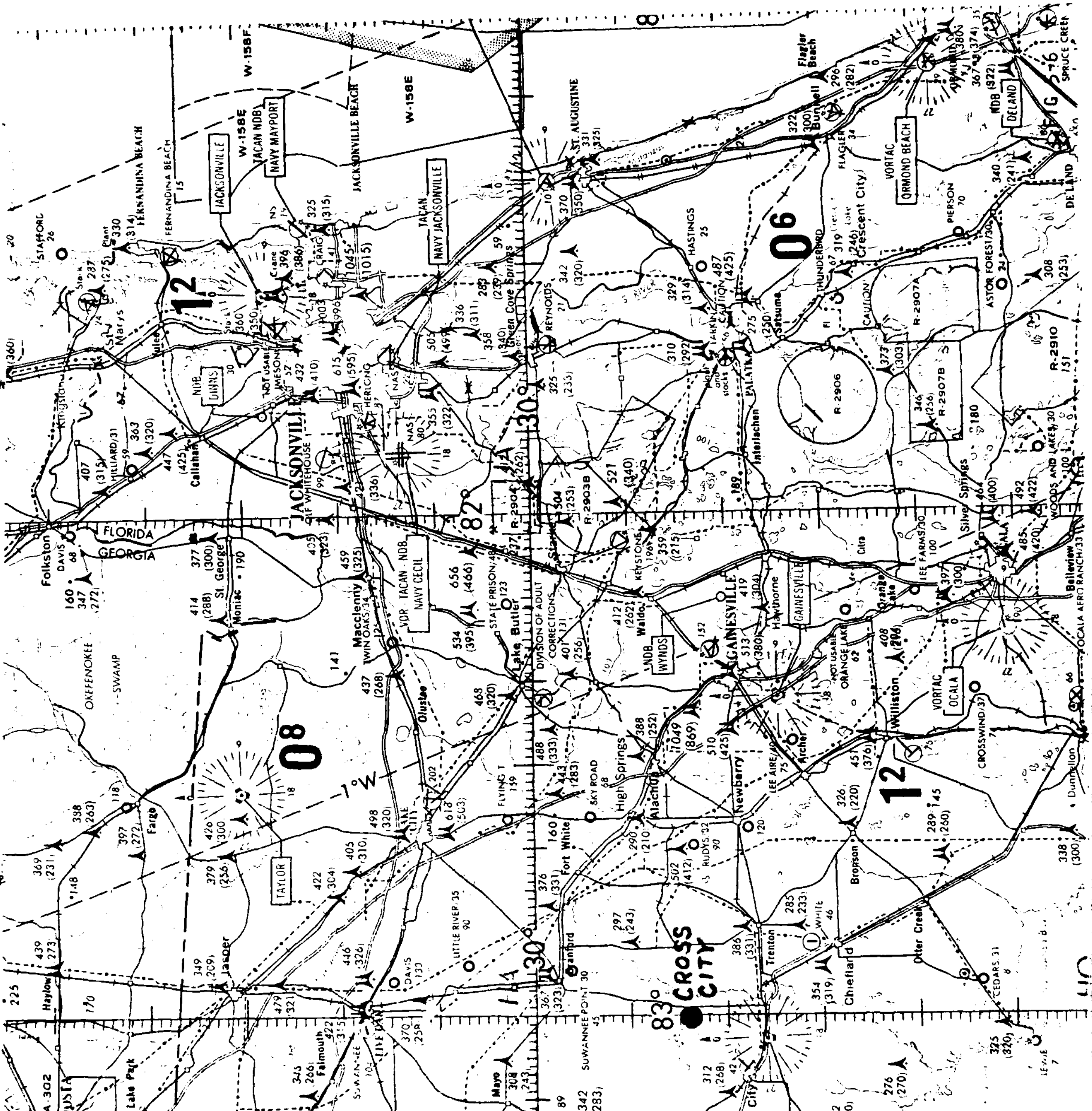

UNLIGHTED AND UNMARKED
BALLOON AND CABLE TO 14,000' MSL
LOCATED INSIDE R-2916
GULF OF MEXICO
FLORIDA
STRAITS
OF
COASTAL ADIZ
W-465
W-174C
SAL BANK
FLORIDA BAY
CHANNEL
KEY WEST
MIAMI
MIAMI BEACH
RICHMOND
HOMESTEAD
FORT LAUDERDALE
BISCAYNE BAY
PERRINE
ORTAN
MARATHON
FISH HOOK
NAVY KEY WEST
Everglades City
Islamorada
Flamingo
Marathon
Big Pine
Tavernier
PORT LARGO
Rock Harbor
OCEAN REEF CLUB
05
07
12
142
0
JL
KL
LL
25°
80°
81°
82°

FIG 5-4 (2)



ORLANDO
KISSIMMEE
SANFORD
Apopka
Mount Dora
Eustis
Umatilla
Clermont
Groveland
Polk City
Davenport
Haines City
Winter Haven
LAKELAND
Bartow
Fort Meade
Frostproof
Lake Wales
Avon Park
Sebring
Wauchula
Arcadia
Holopaw
St. Cloud
Christmas
Titusville
Cocoa
Cocoa Beach
Rockledge
Melbourne
Vero Beach
Okeechobee
Brighton
Childs
TAMPA
ST. PETERSBURG
CLEARWATER
DUNEDIN
TARPON SPRINGS
New Port Richey
Zephyrhills
Dade City
Lacoochee
Brooksville
Masaryktown
Bushnell
Wildwood
Coleman
Floral City
Crystal River
Homosassa
Bayport
Ruskin
Wimauma
Duette
BRADENTON
SARASOTA
FT. LONESOME
83°
82°
81°
28°


JACKSONVILLE
NAVY JACKSONVILLE
NAVY MAYPORT
JACKSONVILLE BEACH
FERNANDINA BEACH
ST. AUGUSTINE
VOR · TACAN · NDB
NAVY CECIL
GAINESVILLE
CROSS CITY
FLORIDA
GEORGIA
OKEFENOKEE
SWAMP
Folkston
Callahan
Macclenny
Olustee
Lake Butler
Waldo
Hawthorne
Palatka
Interlachen
Hastings
Satsuma
Crescent City
ORMOND BEACH
DELAND
Flagler Beach
Bunnell
Silver Springs
Alachua
High Springs
Newberry
Archer
Williston
Bronson
Chiefland
Trenton
Fort White
Branford
Otter Creek
Dunnellon
Jasper
Fargo
Haylow
Lake Park
Madison
Greenville
Perry
Mayo
Cross City
Steinhatchee
Monticello
R-2906
R-2910
W-158E
W-158F
TAYLOR

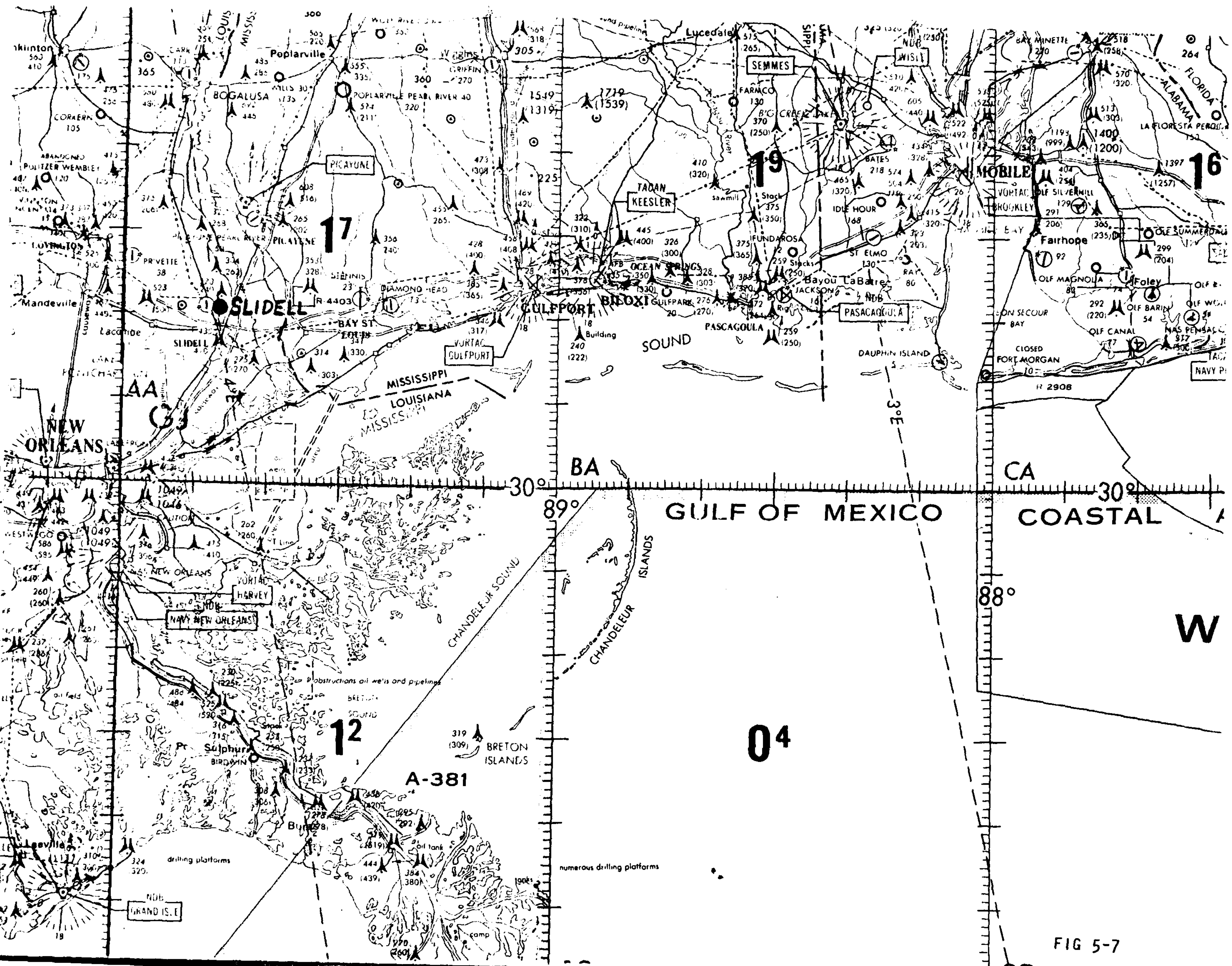
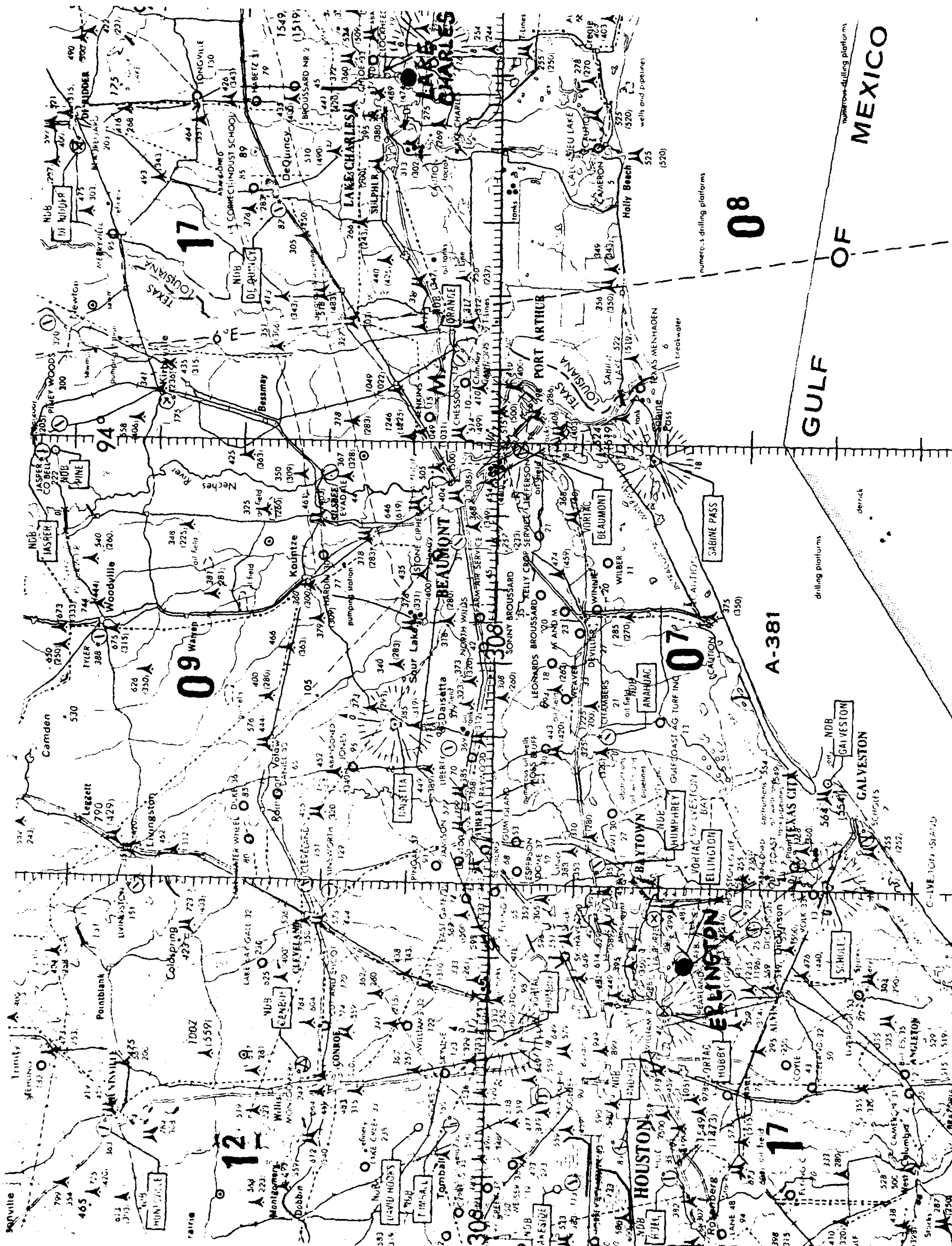

GULF OF MEXICO
COASTAL
NEW ORLEANS
SLIDELL
GULFPORT
BILOXI
MOBILE
PASCAGOULA
Poplarville
BOGALUSA
PICAYUNE
Mandeville
Lacombe
Lucedale
SEMMES
KEESLER
TADAN
OCEAN SPRINGS
Bayou LaBatre
Fairhope
Foley
SOUND
MISSISSIPPI
LOUISIANA
ALABAMA
FLORIDA
CHANDELEUR SOUND
CHANDELEUR ISLANDS
BRETON ISLANDS
DAUPHIN ISLAND
FORT MORGAN
NAVY NEW ORLEANS
NAVY PENSACOLA
GRAND IS.E
Sulphur
A-381
3°E
30°
89°
88°
BA
CA
AA
W
17
19
16
12
04
drilling platforms
numerous drilling platforms
obstructions oil wells and pipelines

FIG 5-7



GULF OF MEXICO
HOUSTON
BEAUMONT
PORT ARTHUR
LAKE CHARLES
LAKE CHARLES
GALVESTON
TEXAS CITY
ELLINGTON
BAYTOWN
TEXAS
LOUISIANA
A-381
08
09
07
17
17
12
94°
6°E
numerous drilling platforms
drilling platforms
wells and pipelines
SABINE PASS
Sabine Pass
Holly Beach
Cameron
DeQuincy
DeRidder
Woodville
Kountze
Livingston
Conroe
Cleveland
Dayton
Liberty
Sour Lake
Daisetta
Silsbee
Jasper
Kirbyville
Bessmay
Sulphur
Orange
Camden
Leggett
Coldspring
Pointblank
Trinity
Huntsville
Montgomery
Tomball
Rosenberg
Angleton
Alvin
Dickinson
Brazoria
West Columbia

FIG 5-8

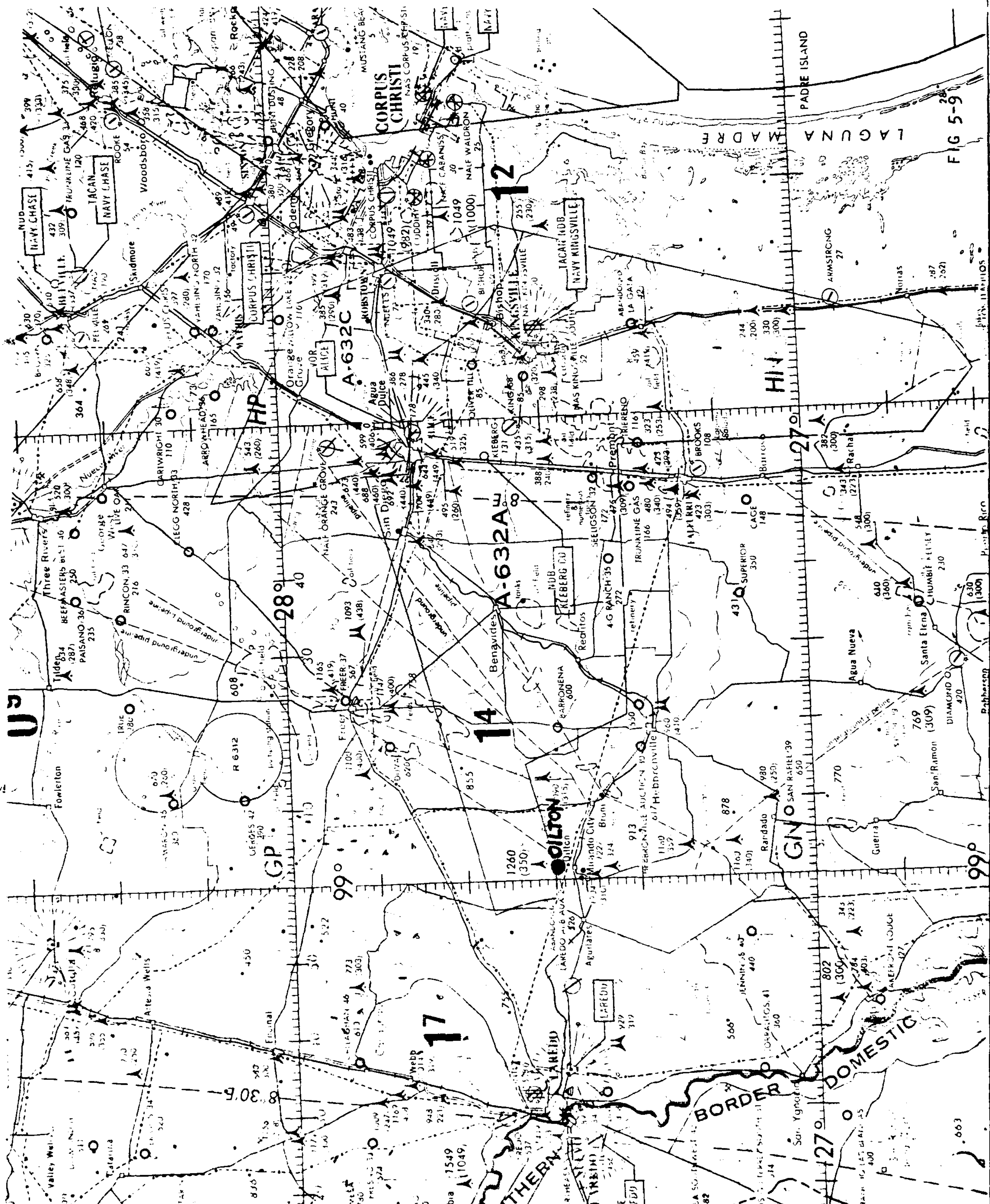

CORPUS CHRISTI
PADRE ISLAND
LAGUNA MADRE
A-632C
A-632A
LAREDO
SOUTHERN BORDER DOMESTIC
NAVY KINGSVILLE
NAVY CHASE
KLEBERG CO
ALICE
OILTON

FIG 5-9

OPERATIONALLY SIGNIFICANT FORECAST PROBLEMS

As of 1 February 1981, this unit identifies no operationally significant forecast problems.

AD-A105 085 WEATHER WING (5TH) LANGLEY AFB VA F/G 4/2

TERMINAL FORECAST REFERENCE NOTEBOOK, DETACHMENT 9, 12TH WEATHE--ETC(U)

FEB 81

UNCLASSIFIED 5WW/TFRN-81/003 SBIE-AD-E850 102 NL

APPROVED LOCAL FORECAST STUDIES

The only approved forecast study for Tyndall AFB is "Forecasting Summer Thunderstorms" at Tyndall AFB, Florida.

FORECASTING SUMMER THUNDERSTORMS
AT
TYNDALL AFB, FLORIDA

By
TSgt Harry L. Edwards

17 August 1967

Detachment 5, 32nd Weather Squadron
Tyndall AFB, Florida 32401

UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Det 5, 32 Wea Sq Tyndall AFB, FL 32401	2a. REPORT SECURITY CLASSIFICATION Unclassified 2b. GROUP N/A

3. REPORT TITLE

Forecasting Summer Thunderstorms at Tyndall Air Force Base, Florida

4. DESCRIPTIVE NOTES (Type of report and inclusive dates)

N/A

5. AUTHOR(S) (First name, middle initial, last name)

TSgt Harry L. Edwards

6. REPORT DATE	7a. TOTAL NO OF PAGES	7b. NO. OF REFS
17 August 1967	23	

8a. CONTRACT OR GRANT NO b. PROJECT NO c. d.	9a. ORIGINATOR'S REPORT NUMBER(S) N/A 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)

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11. SUPPLEMENTARY NOTES N/A	12. SPONSORING MILITARY ACTIVITY Hq 4th Weather Wing Aerospace Sciences Division Ent AFB, CO 80912

13. ABSTRACT

This climatological study summarizes several characteristics of thunderstorms at Tyndall AFB, Florida, based on six years of local observations. The climatological summaries in this paper are portrayed in a manner to facilitate their use as an aid in the daily forecast routine.

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Security Classification

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DD FORM 1 NOV 65 1473

UNCLASSIFIED
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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT

INTRODUCTION: Florida peninsula is the primary area of thunderstorm activity in the United States, according to the USWB Technical Paper Number 10, "Mean Number of Thunderstorm Days in the United States." This paper shows that July, with 17 thunderstorm days and August with 16, are the peak months of thunderstorm activity here at Tyndall.

CAUSES AND THE FORECAST PROBLEMS: Byers and Rodebush, in the Journal of Meteorology, December 1948, explained that the primary causes of thunderstorms in Florida are complex, but are mainly due to the convergence of the sea breezes coupled with unstable air masses which dominate this area during the summer.

After the formation of a thunderstorm, the forecasting problem is due to the complex build-up and decay of the individual cells with the usual light and variable winds aloft making an accurate movement forecast very difficult.

At the present time an objective thunderstorm forecast study is available, however, it has not proven to be very reliable. Due to the nature of our forecasting problem, it is doubtful that a good objective method will be developed in the near future.

It is believed that the best technique for forecasting thunderstorms during the summer months is the use of climatology coupled with visual and radar observations for a short-range period of 3 hours or less.

PURPOSE: The purpose of this study is to investigate the thunderstorm as it affects Tyndall, and to define certain climatological parameters into useful forecasting terms in order that they may be utilized in the 24 hour forecast.

DATA AVAILABLE FOR STUDY: Six years of records from January 1961 to December 1966 plus the A and B Summary of Surface Weather Observations (June 1951-May 1961) were available. This data is considered sufficient to establish a normal for Tyndall.

ANALYSIS OF THE DATA: Nine questions which arise in connection with thunderstorm forecasting were considered and the climatological answers derived. All times used in the study are Central Standard Time (CST).

QUESTION 1: Which are the significant thunderstorm months?

CLIMATOLOGY: See Figure 1.

ANSWER: June through August, with the peak months of July and August.

QUESTION 2: What are the diurnal variations of thunderstorms?

CLIMATOLOGY: See Figures 2 through 5.

ANSWER: The entire thunderstorm season does not have the same diurnal variation. A comparison of Figure 5 (thunderstorm season) with Figures 3 and 4 show that each month has its own variations. For this reason, each month was treated separately.

FIGURE 2 is a histograph which shows at a glance the times of thunderstorm occurrences. All available data were used.

FIGURE 3 consists of three graphs utilizing all available data. The majority of thunderstorms occur between 1100 CST - 1600 CST with an increase in activity in the morning during July and August.

FIGURE 4 consists of three graphs utilizing the WBAN's (June-August 1961 to 1966). Smoothing is reduced as a result of this. Over half the

thunderstorms in June occurred during the period 1000 CST - 1700 CST. In July there was no significant time of increased activity. The month of August shows an increase of activity between 0400 CST - 0800 CST and again between 1100 CST - 1800 CST. An impressive 70% of all the activity occurs between these hours. Figure 5 summarizes the complete thunderstorm season. As expected, 50% of the thunderstorm activity occurs between 1000 CST and 1700 CST.

QUESTION 3: How long do the thunderstorms last?

CLIMATOLOGY: See Figure 6.

ANSWER: The average duration of a single thunderstorm is slightly over one hour, with 62% of all thunderstorms lasting between 31 minutes and two hours. It has been found that of all thunderstorms that occur in the morning (0230 - 1030 LST), 30% will regenerate again in the afternoon during June and August. During July, 54% will recur during the afternoon.

QUESTION 4: What ceiling and visibility forecast will hit most of the time?

CLIMATOLOGY: See Figure 7.

ANSWER: The chart on the left depicts all observations with thunderstorms (Circular N definition). It was observed that 24% of the observations were below VFR limits (1500/3) and less than 2% were below GCA limits (200/½). The right hand chart depicts the actual lowest condition that occurred during individual thunderstorms. It was observed that 30% of the thunderstorms produced conditions below VFR limits (1500/3) while 5% were below GCA limits (200/½). These charts indicate that a forecast

would be hit most of the time if we forecast a ceiling and visibility that is equal to or greater than 1500/3. This would be especially true for a forecast over a three-hour period. For a short period, less than 3 hours, your observer and radar are by far your best tools. Thunderstorms that move overhead will usually produce ceilings and visibility below VFR limits (1500/3).

QUESTION 5: What are the thunderstorm cycles?

CLIMATOLOGY: See Figures 8 and 9[1].

ANSWER: Figure 8 summarizes the thunderstorm season. The left hand chart shows that thunderstorms occur at least 50% of the time in cycles of 2 or more days during June and July and in one-day cycles during August. The right hand chart shows that for any given time during the season, thunderstorms occur in one-day cycles. Figure 9 shows that during June, between 1030 CST - 1830 CST is the most ideal time for thunderstorms to occur in cycles of 2 or more days. In July, this period would be 0230 CST - 1830 CST and in August would be 0230 CST - 1030 CST.

[1]NOTE: From left to right, the first value on the bar graph is the frequency of cases in a one-day cycle only. The second percentage value represents the cumulative frequency of cases for all remaining cycles of two days or more. The second value does not represent the frequency of cases with exactly two days. The sum of the first two percentage values therefore equals 100%. The other percentage values in the graphs are also cumulative values. To find the frequency for exactly two days, three days, and four days, one must therefore perform a subtraction. For example, consider the June graph (lower left corner of Figure 8). The value 42 means 42% of the occurrences were single day occurrences only. The value 58 means 58% (or the remaining cases) occurred in cycles of two days or more. All cases have now been considered (42% + 58% = 100%). The remaining values are a further breakdown of the cases included in the 58% group. (31% exactly 2 days, 11% exactly 3 days, 13% exactly 4 days, 3% all other cases ≥ 5 days, all of which add up to 58%). This scheme is followed in all remaining graphs in this paper.

QUESTION 6: What are the cycles of nonoccurrence of thunderstorms?

CLIMATOLOGY: See Figures 10 and 11.

ANSWER: Figure 10 summarizes the thunderstorm season. The left hand chart depicts that nonoccurrences occur at least 50% of the time in three-day cycles or more during June and July and a two-day cycle or more in August. The right hand chart shows that the best flying time would be between 1830 CST - 0230 CST, since the cylces of nonoccurrence are in 5 or more day cycles, and the afternoon, the worst period, a cycle of three of more days. In the morning period, 0230 CST - 1030 CST, we could expect a cycle of four days without a thunderstorm. Figure 11 again shows that for each month the period 1830 CST - 0230 CST is the best period for flying, particularly in June and August. In the period 1030 CST - 1830 CST, the cycle of nonoccurrence for June is 5 days, July 2 days, and August 3 days. For the period 0230 CST - 1030 CST, the cycle of nonoccurrence shows that June again is by far the best month with a 70% chance of thunderstorms occurring in a 5-day cycle. For July and August the cycle is only three days.

QUESTION 7: How well does persistence work for thunderstorm occurrence?

CLIMATOLOGY: See Figure 12 and 13.

ANSWER: Figure 12 is a summary of the thunderstorm season. If a thunderstorm occurred today there would be a little better than 50% chance of having another tomorrow during June and July, and a 47% chance of reoccurrence in August (reference left hand chart). The right hand chart shows that if a thunderstorm occurred today between 1030 CST - 1830 CST there would be a 40% chance of having another tomorrow between these hours. Figure 13 answers the question, "If a thunderstorm occurred today during a certain period should thunderstorms be forecast again tomorrow during

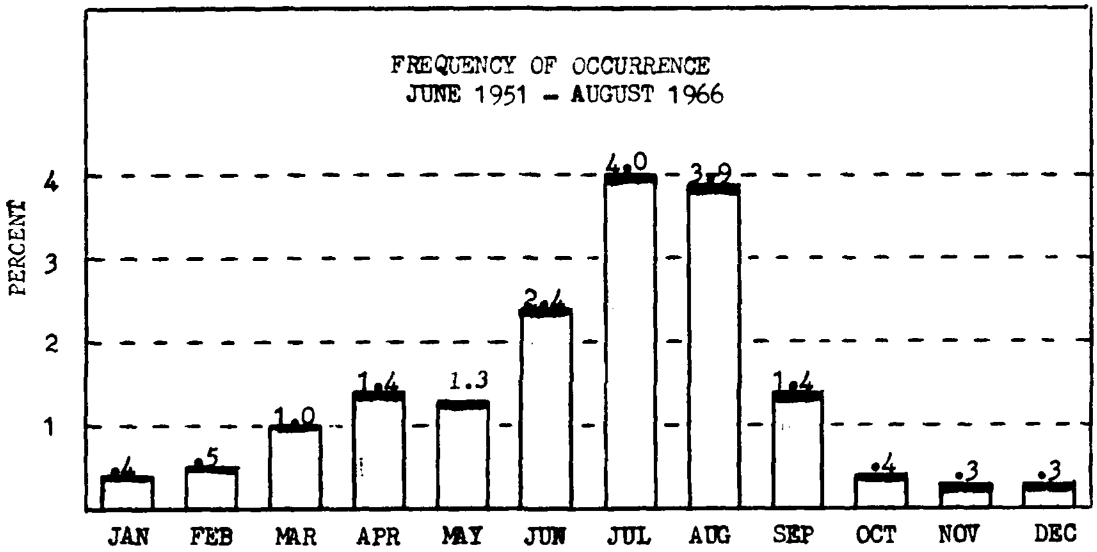
the same time period?" The answer according to the charts for any month and any time is "NO," however, in June and July the best time for a reoccurrence tomorrow is in the time period 1030 CST - 1830 CST and in August 0230 CST - 1830 CST.

<u>QUESTION 8</u>: How well does persistence work for the nonoccurrence of thunderstorms?

<u>CLIMATOLOGY</u>: See Figures 14 and 15.

<u>ANSWER</u>: Figure 14 is a summary of the thunderstorm season. If a thunderstorm did not occur today, one would not expect a thunderstorm to occur for 2 or more days in June, while in July and August only a one-day cycle would be expected (left hand chart). The right hand chart depicts that the nonoccurrence at any given period today has an excellent chance for a nonoccurrence tomorrow. Figure 15 answers the question, "If I do not have a thunderstorm today during a certain period, what is the percentage of not having one tomorrow during the same period, and how long can I expect a nonoccurrence to exist?" The charts are self-explanatory, however, for an example, if on the 19th day of June, I <u>did</u> <u>not</u> <u>have</u> a thunderstorm during the period 1030 CST - 1830 CST. Using the chart, I would know that on June 20th, I would have a 79% chance of not having a thunderstorm; on June 21st, my percentage would drop to 64% and on June 22nd, to 50%. Any date after June 22nd, I would brief on the possibility of thunderstorms.

<u>QUESTION 9</u>: What was the strongest wind gust that was observed with a thunderstorm?



FREQUENCY OF OCCURRENCE
JUNE 1951 - AUGUST 1966
PERCENT
4
3
2
1
.4
.5
1.0
1.4
1.3
2.4
4.0
3.9
1.4
.4
.3
.3
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC

FIGURE 1

ANSWER: June: 44 knots, with 3 storms greater than 30 knots.

July: 46 knots, with 5 storms greater than 30 knots.

August: 40 knots, with 3 storms greater than 30 knots.

SUMMARY AND SUGGESTIONS: This paper has been directed at the forecast of thunderstorms using climatology as the basis of prediction. There are other methods that have been used with some success.

I suggested that the method used by Bailey (1955) should be used in conjunction with climatology to forecast airmass thunderstorms not only at Tyndall, but also in the flying area. Bailey's method is found in J. J. George's book entitled "Weather Forecasting for Aeronautics," pages 407-409, and compiled with the use of K values, pages 410-415. I firmly believe by using these methods we may achieve a better product in our summertime forecasting.

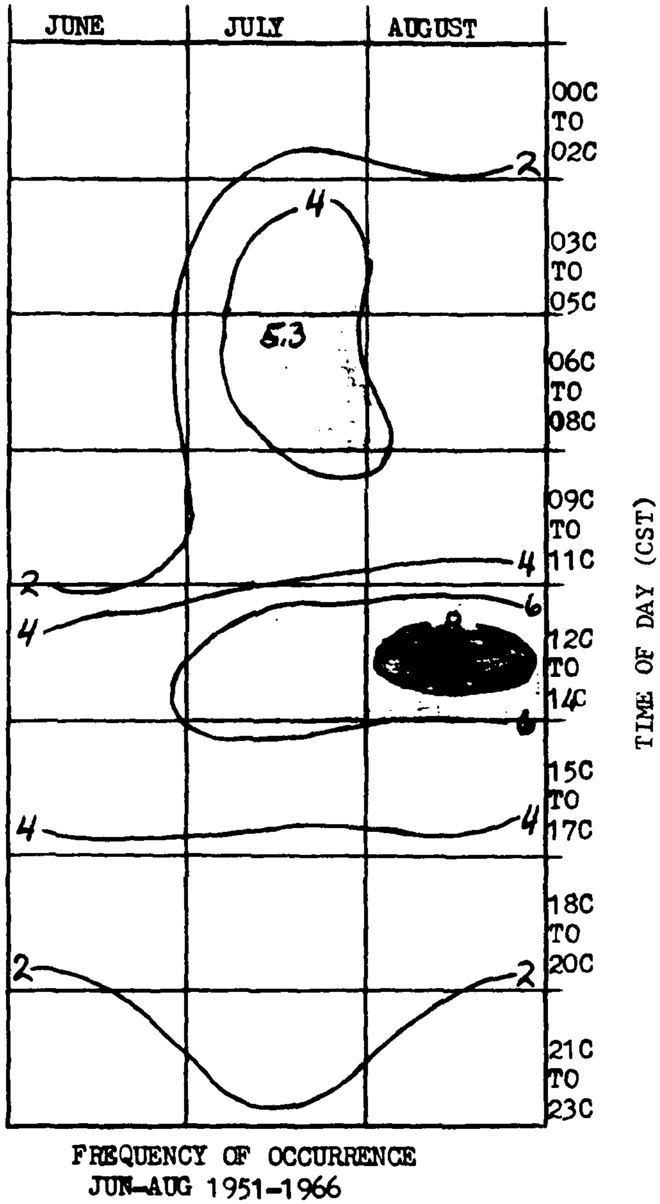

JUNE
JULY
AUGUST
00C TO 02C
03C TO 05C
06C TO 08C
09C TO 11C
12C TO 14C
15C TO 17C
18C TO 20C
21C TO 23C
TIME OF DAY (CST)
2
4
5.3
6
FREQUENCY OF OCCURRENCE
JUN-AUG 1951-1966

FIGURE 2

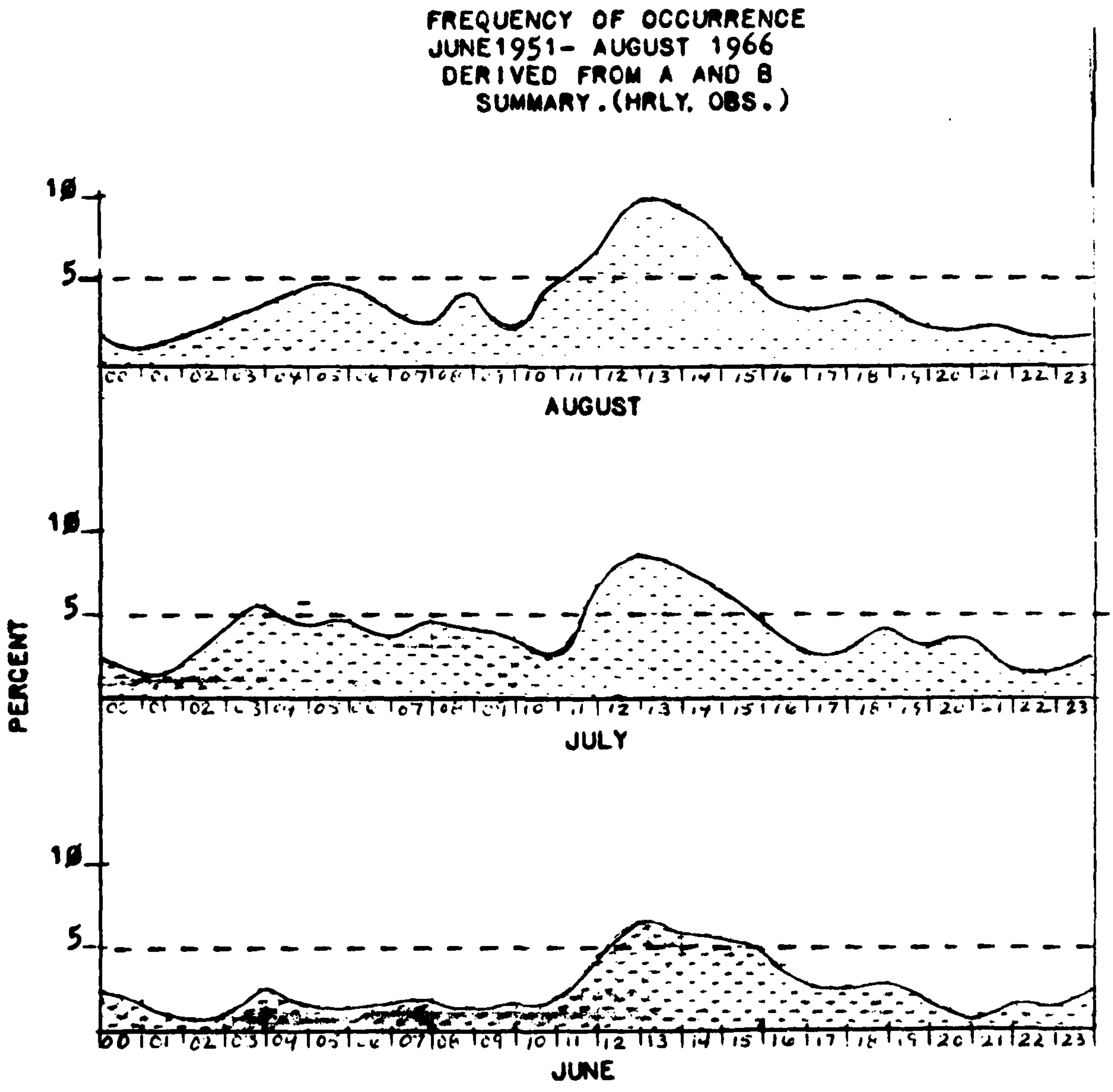

FREQUENCY OF OCCURRENCE
JUNE 1951- AUGUST 1966
DERIVED FROM A AND B
SUMMARY.(HRLY. OBS.)
PERCENT
AUGUST
JULY
JUNE

FIGURE 3

FREQUENCY OF OCCURRENCE
1961-1966
DERIVED FROM WBAN'S (HRLY OBS)

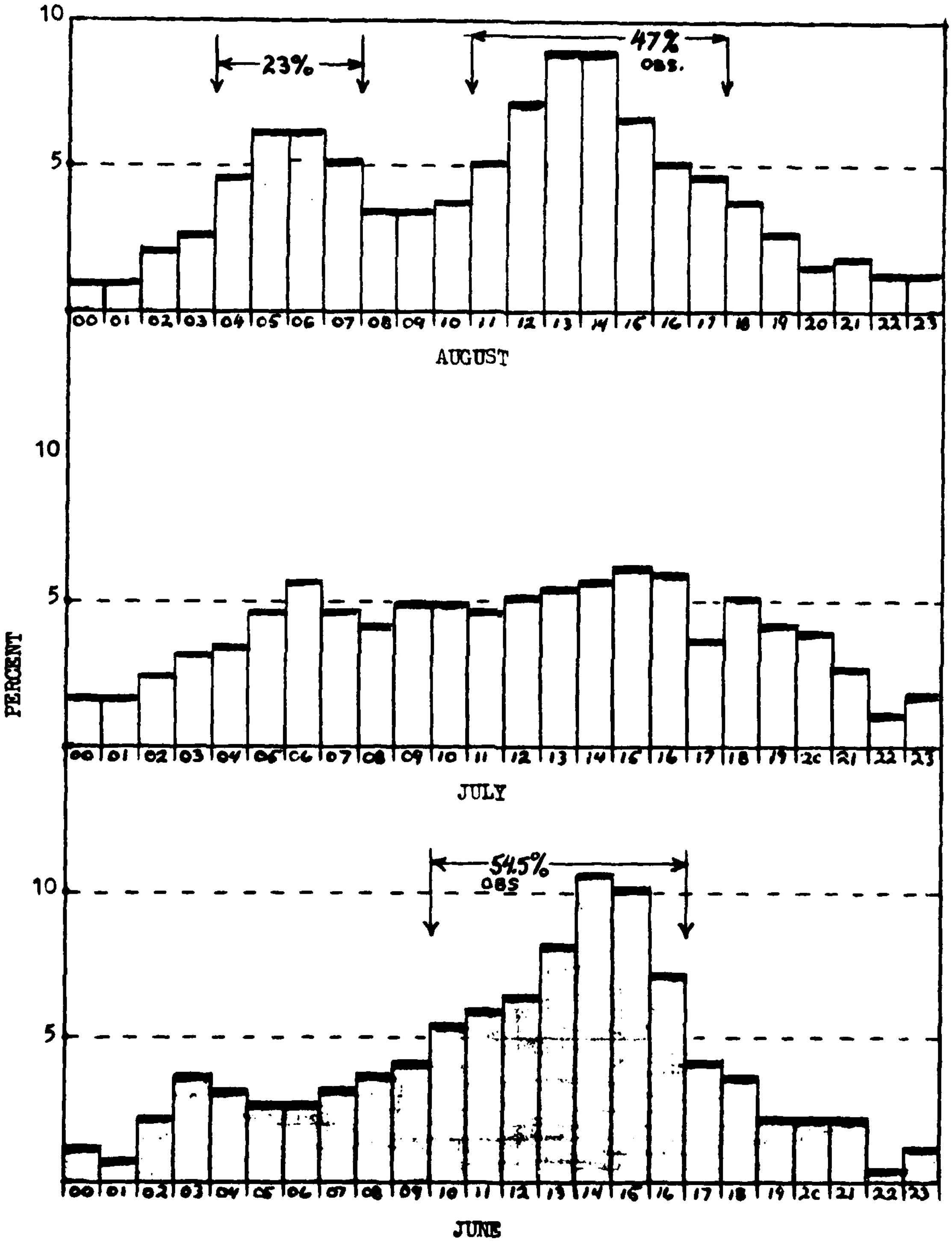
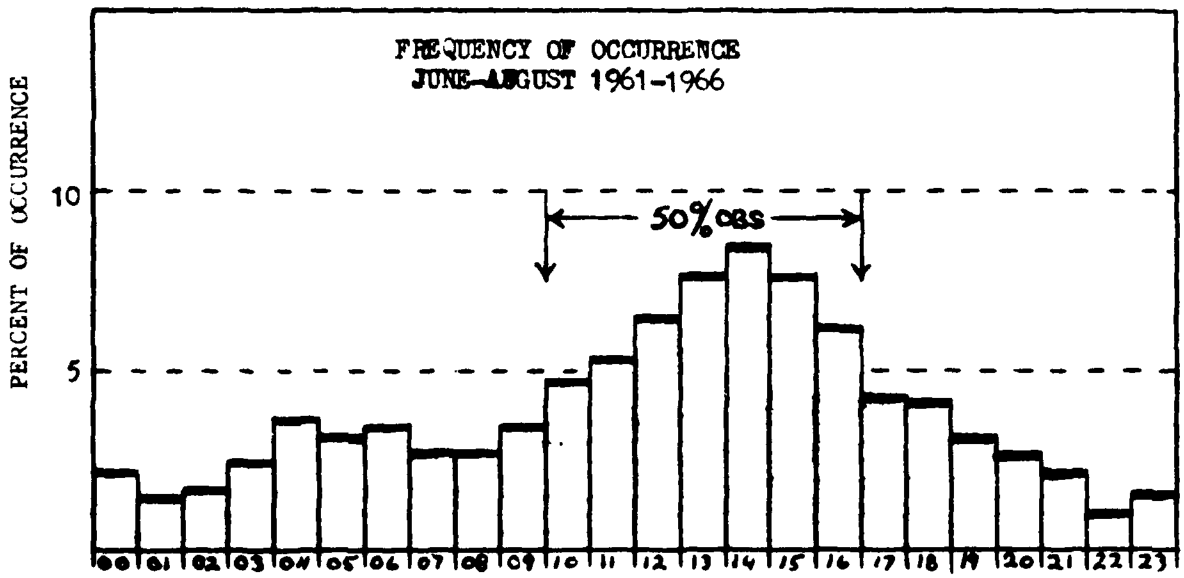
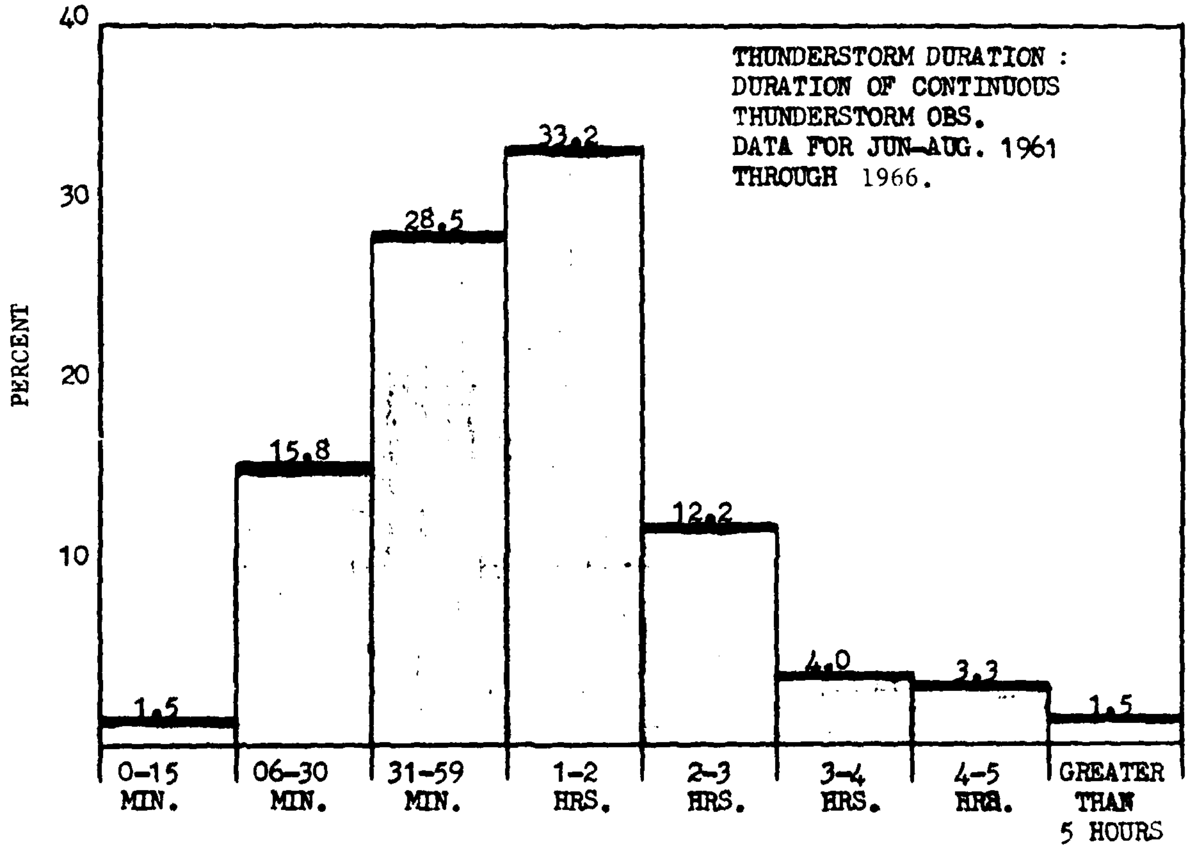


FIGURE 4



FREQUENCY OF OCCURRENCE
JUNE-AUGUST 1961-1966
PERCENT OF OCCURRENCE
10
5
50% OBS
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23

FIGURE 5



THUNDERSTORM DURATION :
DURATION OF CONTINUOUS
THUNDERSTORM OBS.
DATA FOR JUN-AUG. 1961
THROUGH 1966.
PERCENT
40
30
20
10
1.5
15.8
28.5
33.2
12.2
4.0
3.3
1.5
0-15 MIN.
06-30 MIN.
31-59 MIN.
1-2 HRS.
2-3 HRS.
3-4 HRS.
4-5 HRS.
GREATER THAN 5 HOURS

FIGURE 6

CEILING DURING A THUNDERSTORM, JUNE-AUGUST
DATA FROM JUNE-AUGUST, 1961-1966

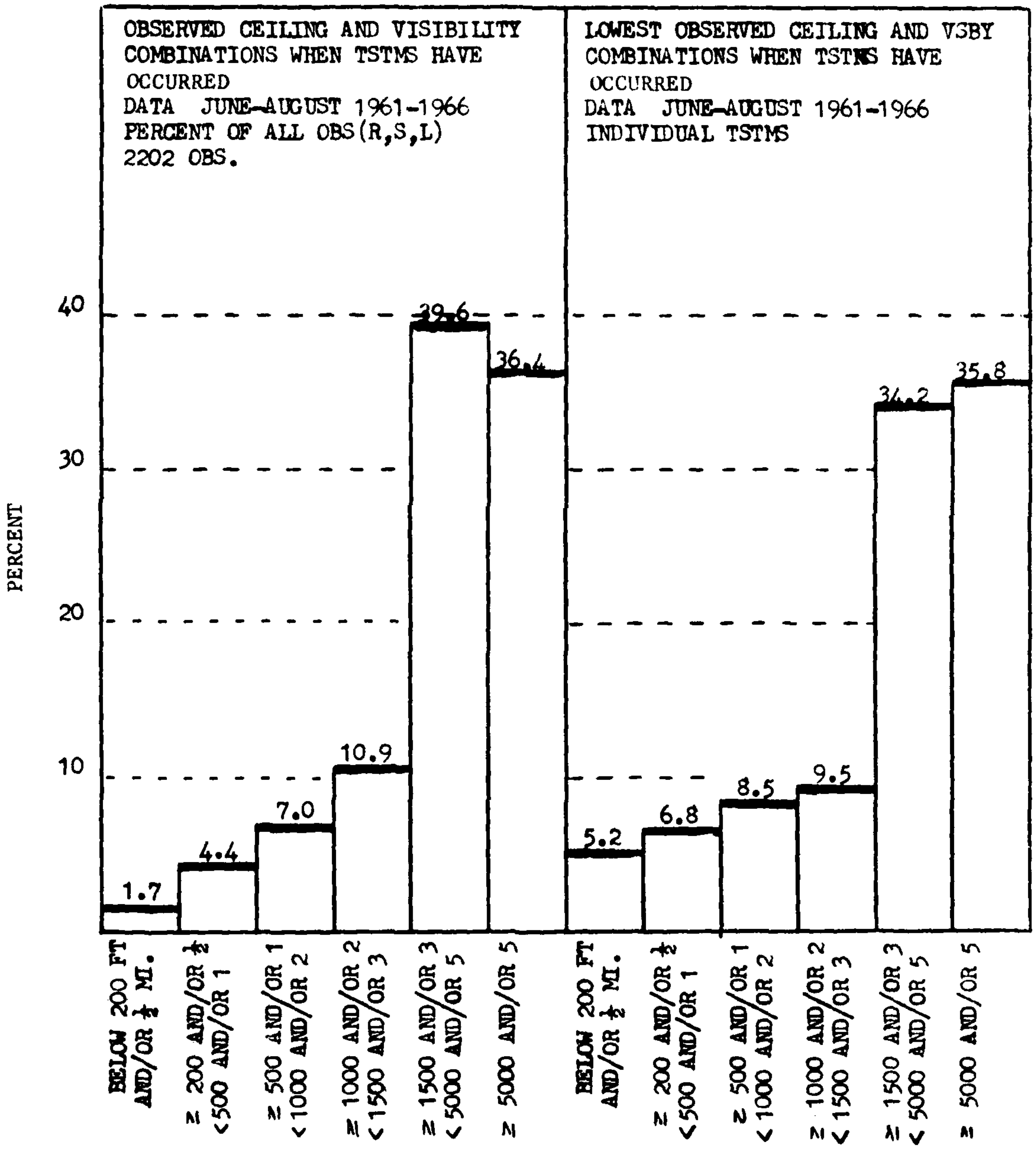


FIGURE 7

THUNDERSTORM OCCURRENCE (DATA FROM JUNE-AUG. 1961-1966)

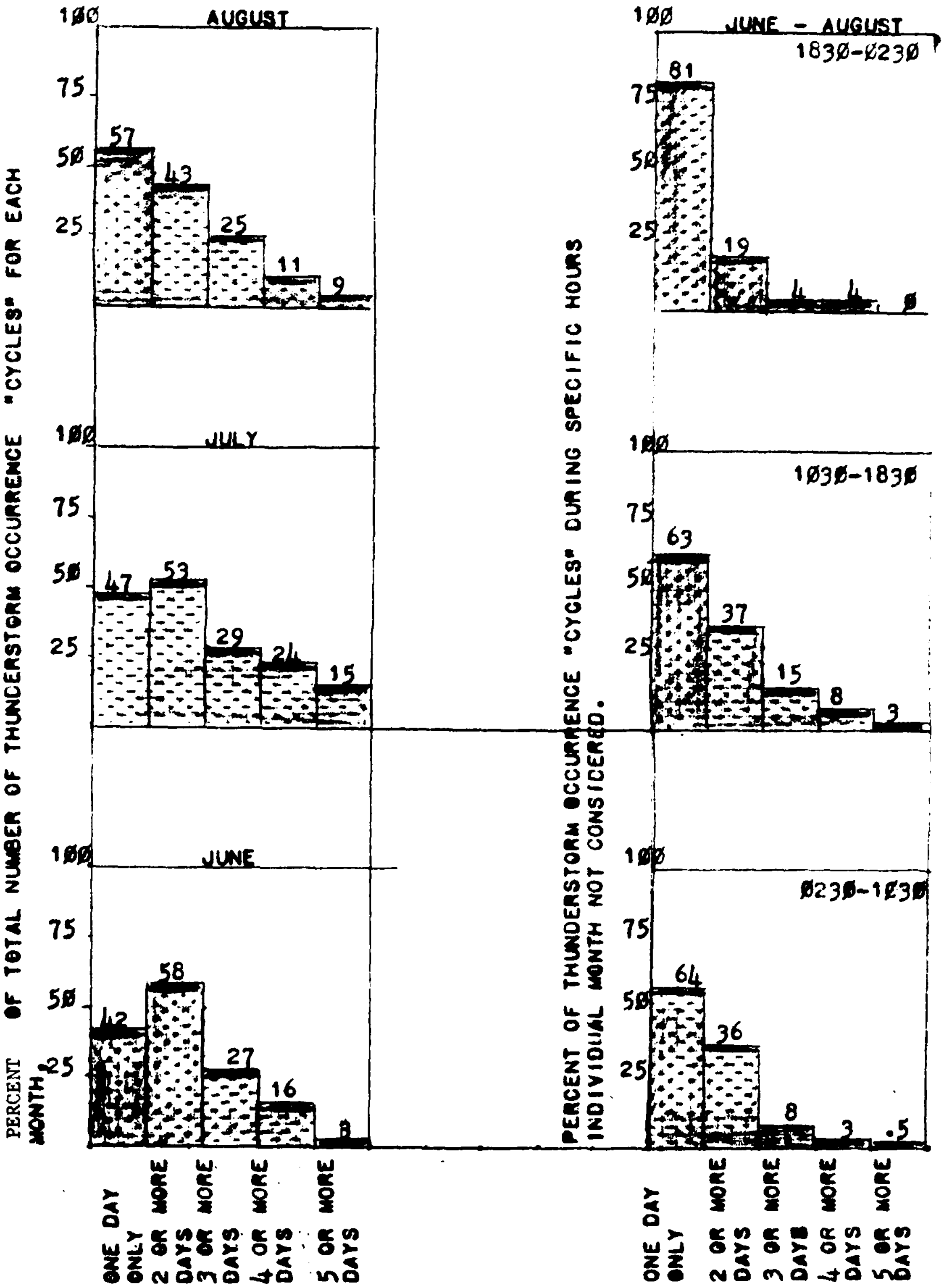


FIGURE 8

THUNDERSTORM OCCURRENCE "CYCLES" DURING SPECIFIED HOURS
(DATA FROM JUNE-AUGUST 1961-1966)

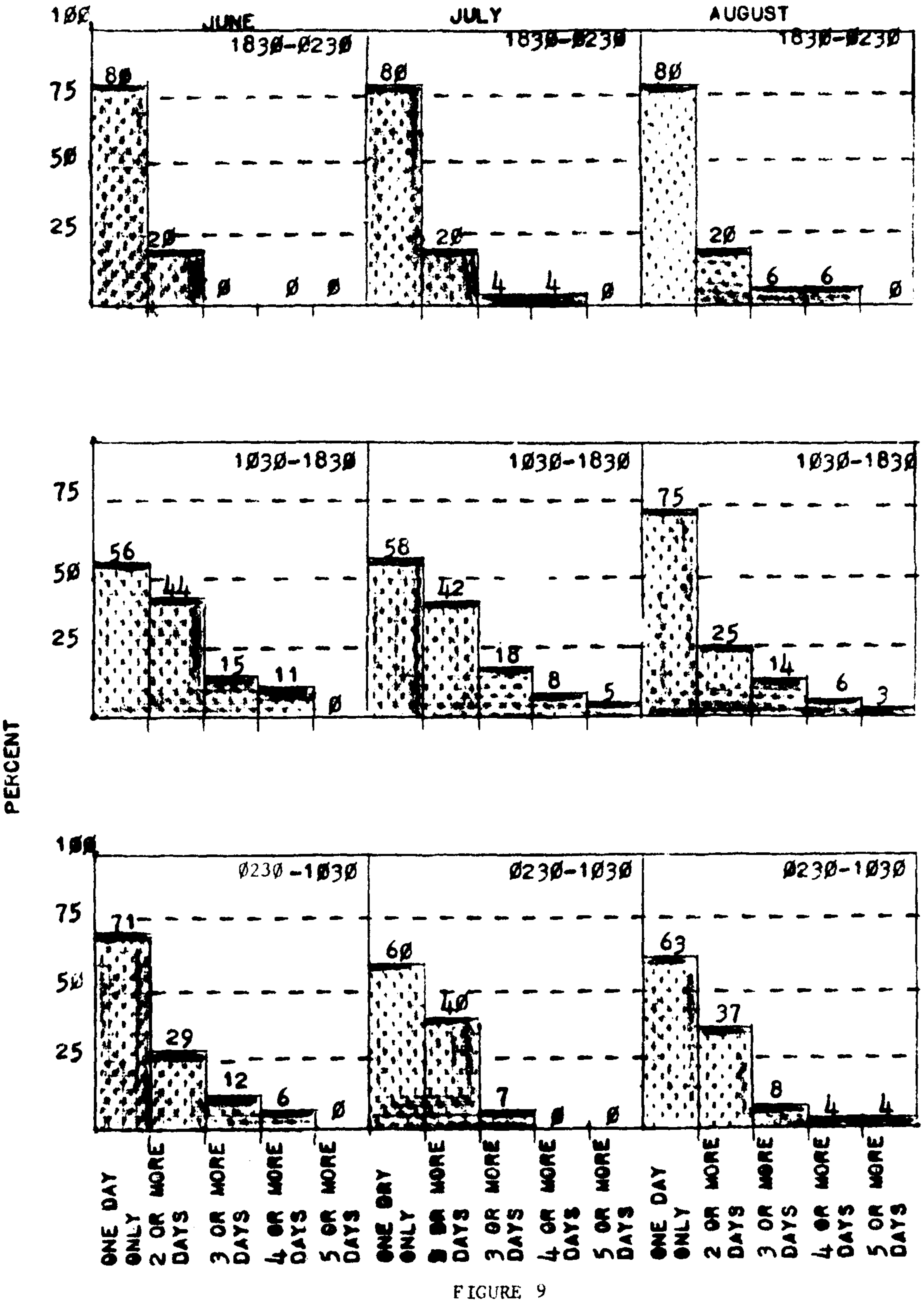


FIGURE 9

THUNDERSTORM NONOCCURRENCE (DATA FROM JUNE-AUGUST 1961-1966)

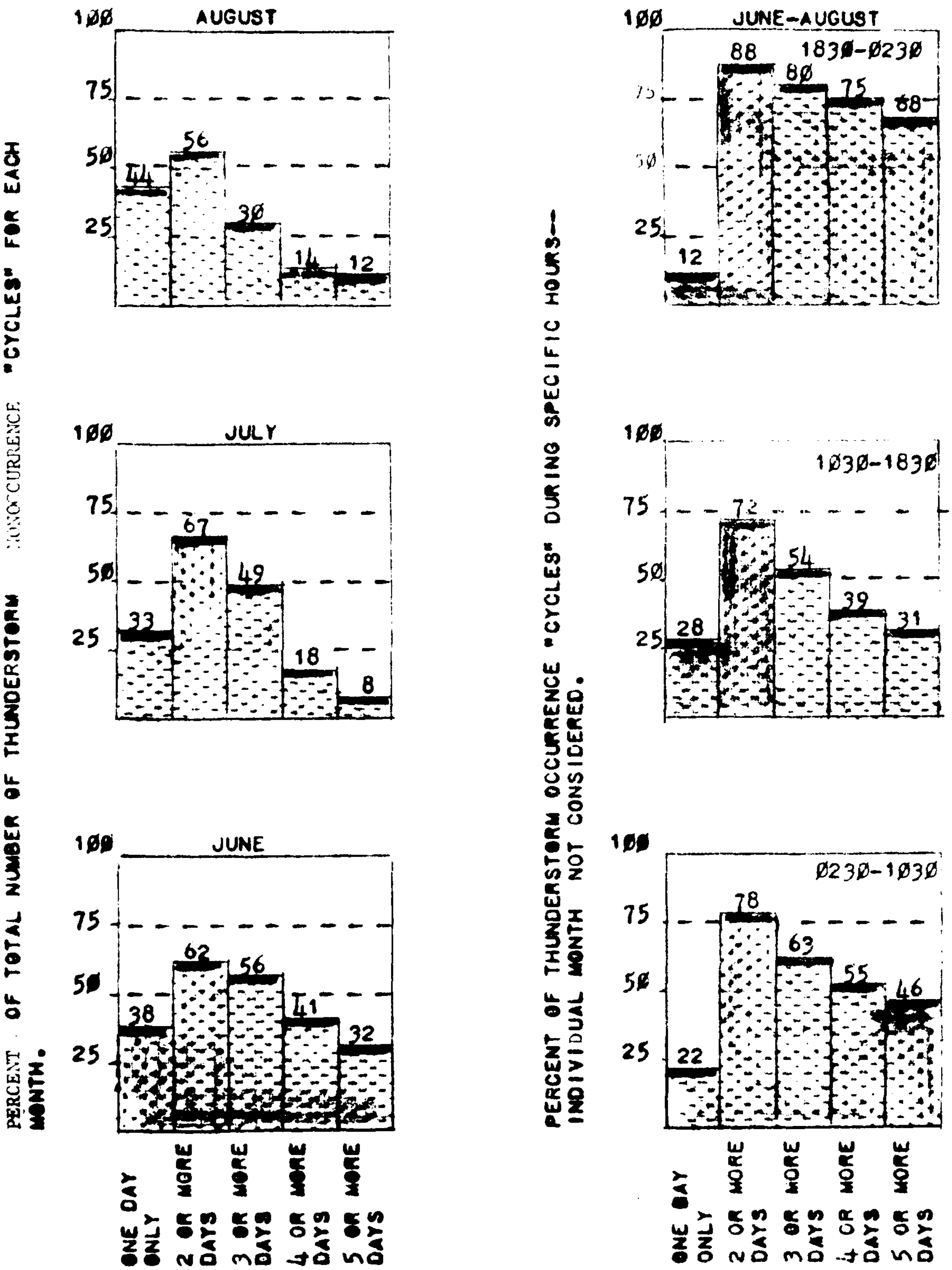


FIGURE 10

THUNDERSTORM NONOCCURRENCE "CYCLES" DURING SPECIFIED HOURS
(DATA FROM JUNE-AUGUST 1961-1966.)

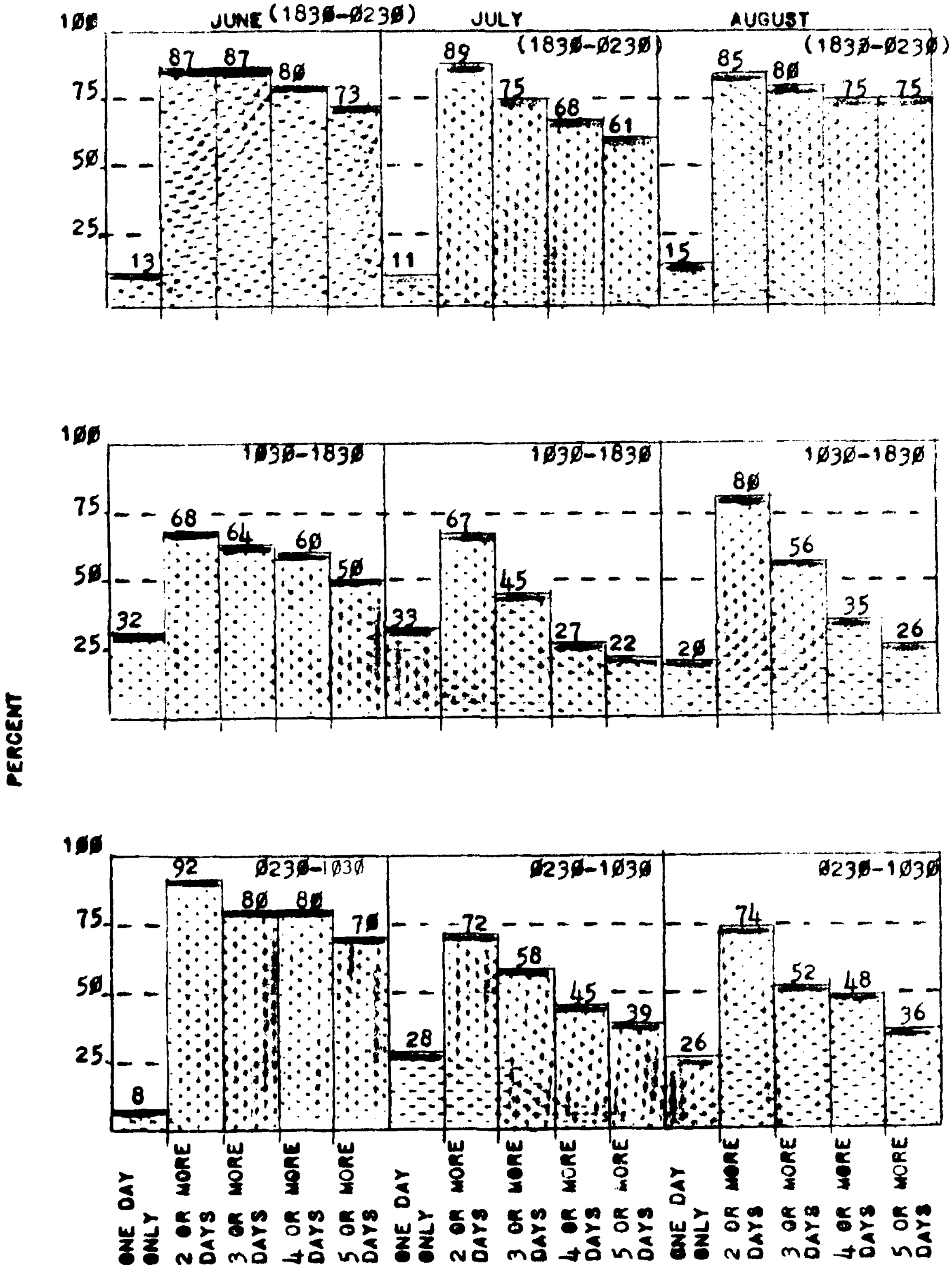


Figure 11

THUNDERSTORM PERSISTENCE - (DATA FROM JUNE-AUGUST 1961-1966)

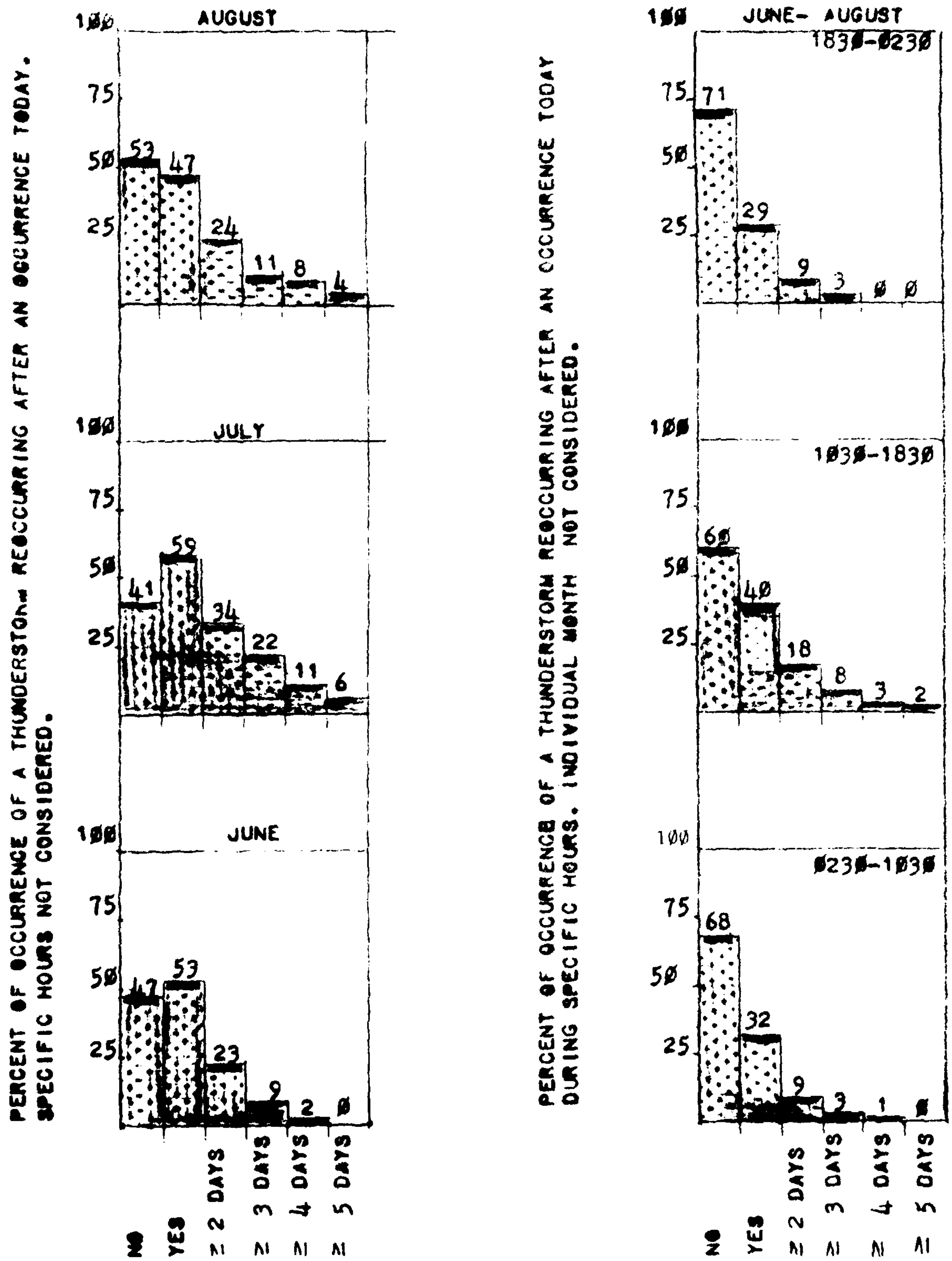


FIGURE 12

THUNDERSTORM PERSISTENCE - DATA FROM JUNE-AUGUST 1961-1966
PERSISTENCE OF A THUNDERSTORM REOCCURRING AFTER AN OCCURRENCE.

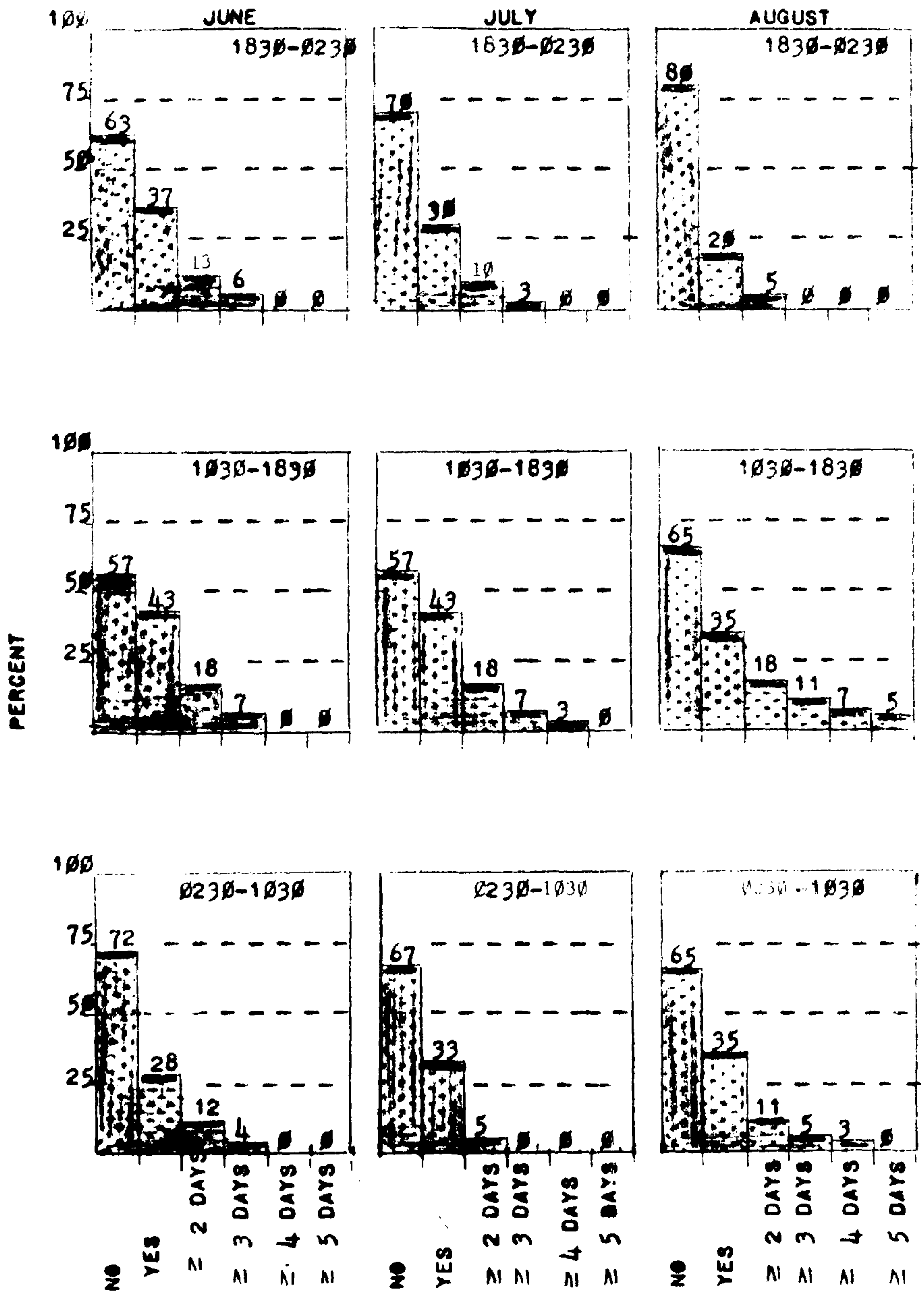


FIGURE 13

THUNDERSTORM NONOCCURRENCE -DATA FROM JUNE-AUGUST 1961-1966
PERSISTENCE OF NONOCCURRENCE OF THUNDERSTORMS IF THEY DO NOT OCCUR TODAY

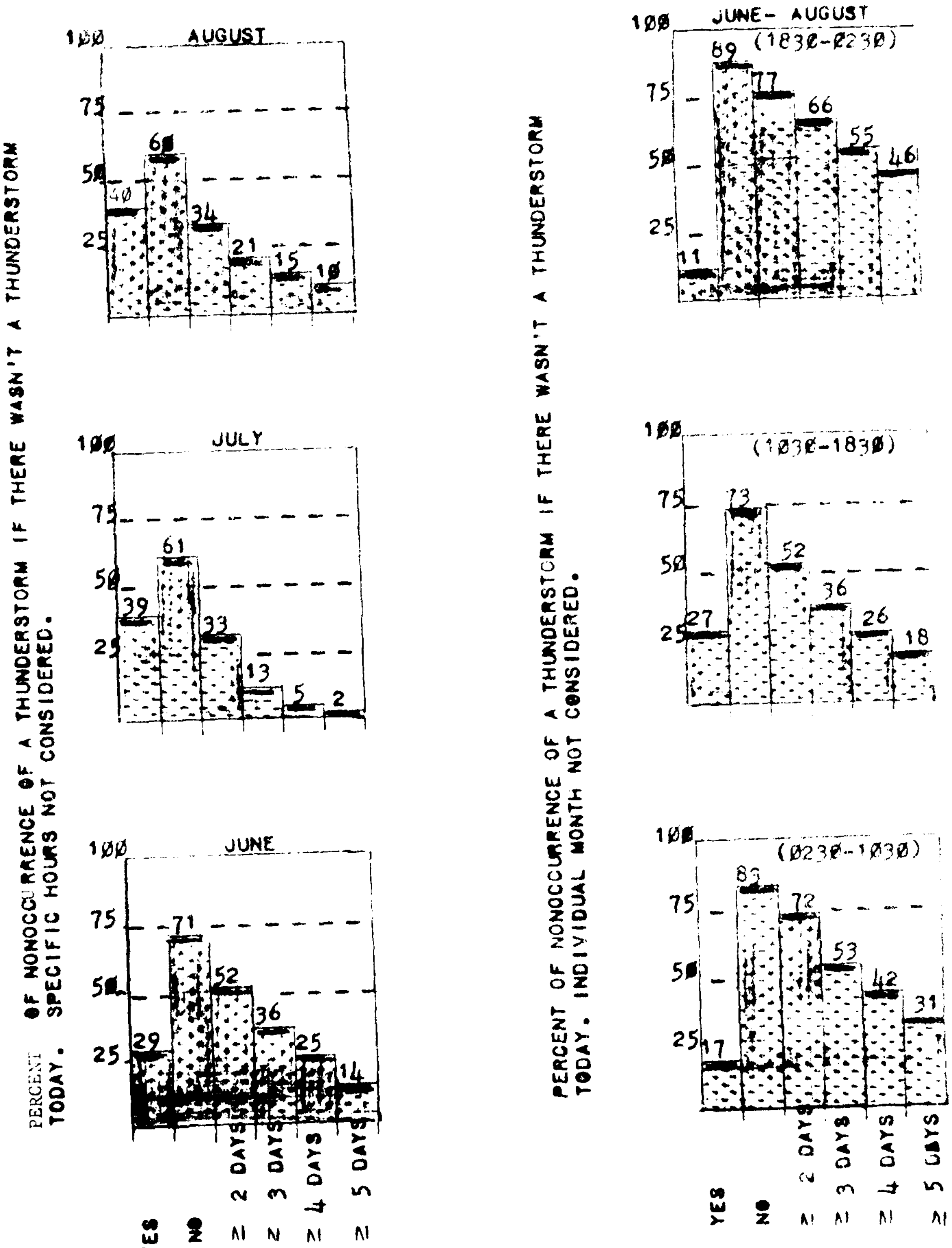


FIGURE 1?

THUNDERSTORM PERSISTENCE - DATA FROM JUNE-AUGUST 1961-1966
PERSISTENCE OF A NONOCCURRENCE OF A THUNDERSTORM AFTER A NONOCCURRENCE TODAY

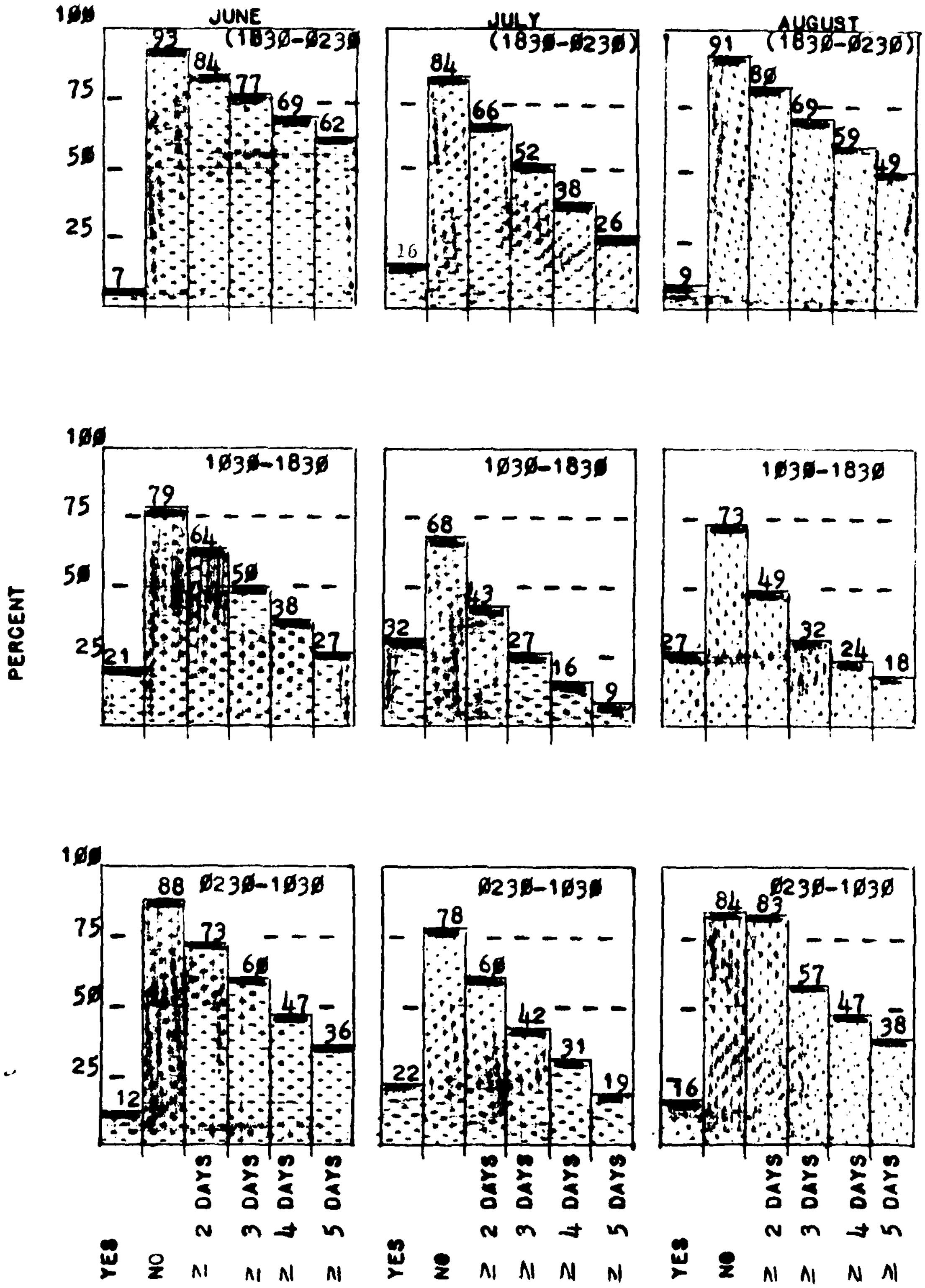


FIGURE 15

RULES OF THUMB

1. No approved Rules of Thumb are in use at TAFB.

2. The following Rule of Thumb is currently being evaluated:

Tyndall AFB will not experience visibility restrictions of less than 3 miles caused by fog unless fog has reduced visibility to at least 3 miles within the previous 24 hours. Note: This does not apply to the onset of sea fog.

CASE STUDIES

No case studies are available for Tyndall AFB as of 1 February 1981.

OPERATIONAL VERIFICATION

Operational Verification for weather criteria critical to the ADWC mission was conducted Oct 78 through Aug 79. The verification was for ceiling/visibility less than 300 ft/1 mi. The low frequency of observed conditions meeting the threshold value made the program of little value. The customer has stated that no other OPVER programs are desired.